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and
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The Outlook

The Pioneers

FROM the very troubled waters of aviation politics of the present, it is pleasant, as well as useful, now and again to turn back the pages of history. Back to the days when man was first struggling to get into the air. He is still struggling, but the struggle has taken on a different character. The 39th anniversary of Bleriot's historic first flight across the Channel, and its commemoration, on July 27th, in the form of the record flights between London and Paris by the Nene-Viking which we reported last week, afford an opportunity to sit back and reflect upon what has been achieved since those early days.

Louis Bleriot, in common with all the early experimenters, had to learn by the laborious method of trial and error. Eiffel's researches in his wind tunnel came later, and even they did not take the pioneers very far in reliable knowledge. The results obtained by the Wright brothers in their tunnel were almost unknown both in Europe and in the United States of America. The science of aerodynamics was still to be founded, and consequently the pioneers were compelled, if they wished to progress at all, to fall back on hit-and-miss attacks on their problems.

They were further handicapped by lack of suitable engines, and several of them designed and built their own. Bleriot was not one of these. His monoplane was powered by a three-cylinder air-cooled Anzani engine, which probably developed no more than 18-20 h.p. Small wonder, therefore, that his machine only did about 45 miles per hour. These figures look somewhat ridiculous when compared with the thrust of the Viking's Nenes and its average speed between London and Paris of 394 m.p.h.

Among those who designed and built their own aircraft and engines was Mr. (now Sir Geoffrey) de Havilland. We described his first machine, the "Havilland I," in *Flight* of April 9th, 1910. It crashed on its first flight and was a complete write-off. Fortunately de Havilland was not hurt. The engine was a "flat-four," with bevel drive to two pusher airscrews. This type of engine has since become popular for low powers, and the airscrews had aluminium blades, "adjustable as to pitch and as to twist" was how we described them. Crude beginnings of the modern airscrew. The machine was built entirely by de Havilland and F. T. Hearle.

In view of the spread of de Havilland Enterprises to nearly all corners of the world, the following quotation from that issue of *Flight* is illuminating: "Possibly, for the sake of accelerating matters, Mr. de Havilland would feel disposed to consider the advisability of arranging for some other would-be pioneer to join him if the right man were to come forward to help him bear the burden of the undertaking. Needless to say, the expense of building preliminary machines like these is considerable if the task is shouldered, as it has been in Mr. de Havilland's case up till now, by one man only." The cost of the prototype has become a somewhat thorny problem once more in modern times.

Then and Now

MOST of the early machines were what the French used to call "tangent." That is to say, the power-available curve was perilously close to being tangent to the power-required curve. At best, the curves cut in two places very close together, which meant that the speed range was very small. It was not until M. Seguin produced the Gnome rotary engine of 50 h.p. that machines began to fly more strongly. Even then there was no question of flying at cruising speed, because the Gnome had no throttle. It either ran at full power or it stopped. The only control which the pilot had over it was by momentarily switching off and then switching on again before the engine could stop. It is somewhat amusing to reflect that in our modern high-power turboprop units we are in difficulties again over the problem

of pilot-control; and the problem cannot be solved by a simple "blip-switch."

Many of the British aircraft firms which are world-famous to-day were started from small beginnings, much as was the de Havilland concern. There was A. V. Roe (now Sir Alliott Verdon-Roe), who was among the earliest British experimenters. Mr. (now Sir Frederick) Handley Page concentrated on automatic stability in his small machines, but in the first world war began his long line of large aircraft. There were Short Brothers, who were the first British company to be formed especially for manufacturing aircraft. They turned to seaplanes and ultimately became specialists in flying boats.

Weird and wonderful as were many of the early flying machines, none was more so than the monoplanes and biplanes designed by Lieut. Dunne. *Flight* described one of them as "the most remarkable and interesting machine yet constructed," and with some truth. It was a tailless pusher, and on one occasion was flown for a considerable time "hands off," the flight being officially observed and attested by Mr. Griffith Brewer. The wheel has now turned full circle, and we have the Armstrong Whitworth tailless machines, designed for low drag rather than the "inherent stability" sought by Dunne. Nowadays we are struggling with swept-back wings to delay the onset of compressibility. Dunne used it forty years ago. Truly there is nothing new under the sun. It is of interest to recall that Dunne was helped in his work by Mr. (now Sir Richard) Fairey, whose firm has since joined the list of the famous.

Few British aircraft engines were available in the earliest days, and many of the experimenters had to use French engines, notably the Gnome. A few years after flying had started, the Green engine was introduced, a four-cylinder water-cooled of some 50 h.p. It was heavy, but comparatively reliable. It took the first world war to give the necessary encouragement, and then began the development which resulted in establishing the fame of such names as Cirrus and de Havilland in the lower powers and Armstrong Siddeley, Bristol, Napier and Rolls-Royce in the high-power ranges. All of these, with the exception of Cirrus, are now taking a leading part in the evolution of turbine power plants.

The fact that so many of the pioneers are still very much alive to-day, and are still contributing their share to the progress of flying, serves to show how far aviation has progressed within the active lifetime of many of our present aircraft constructors.

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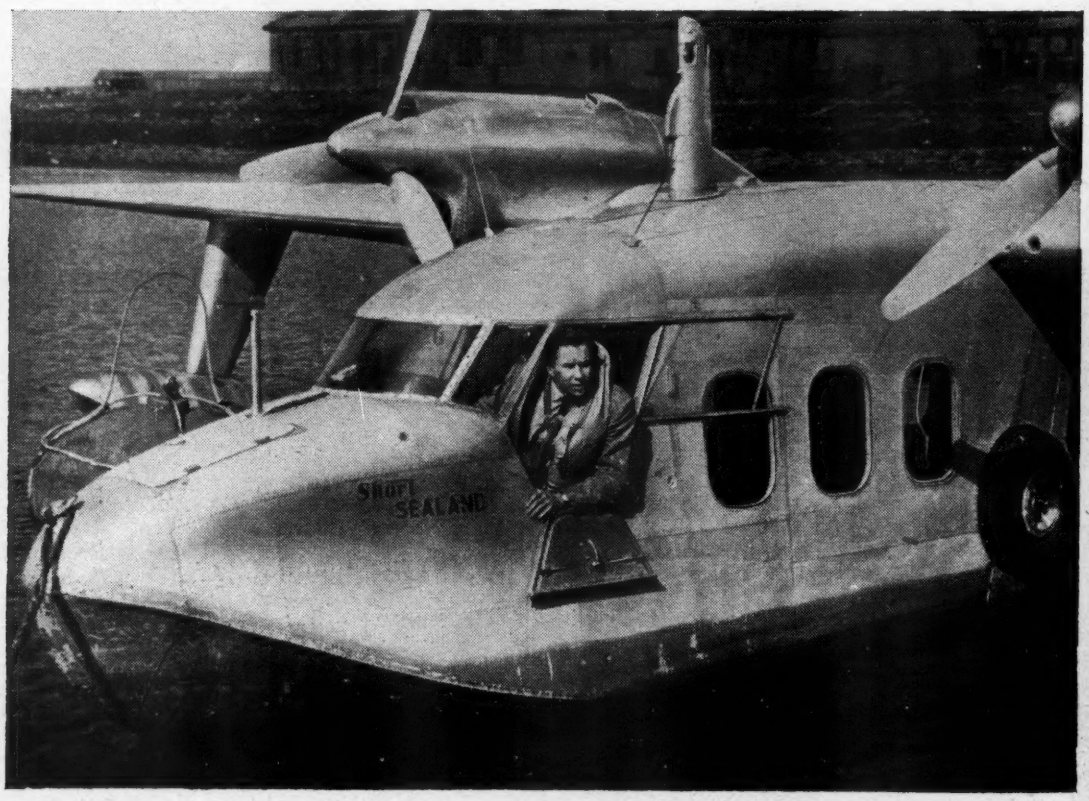
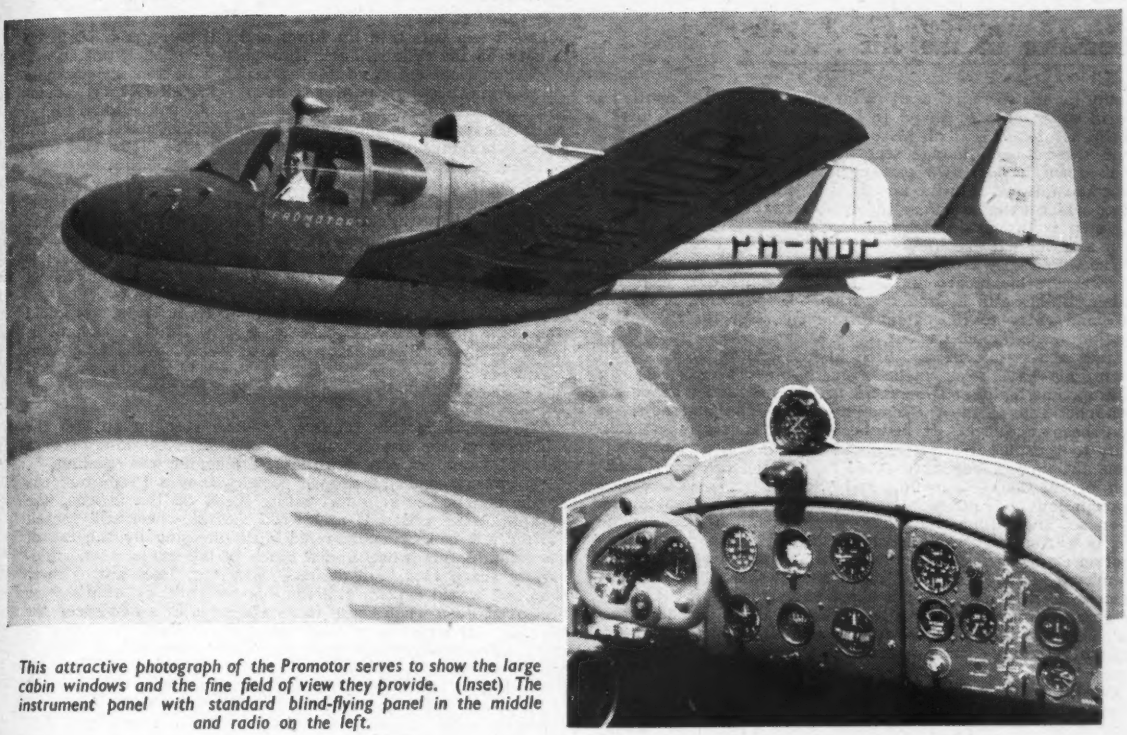


BI-ELEMENTAL: The Short Sealand amphibian flying boat—one of the most promising of Britain's new civil aircraft—after a test flight at Belfast. Mr. Brooke-Smith, chief test pilot, Short Bros. and Harland Ltd., is seen in the spacious cockpit. Two versions of the Sealand are offered: one with D.H. Gipsy Queen engines and the second with the more powerful Alvis Leonides radials.



This attractive photograph of the Promotor serves to show the large cabin windows and the fine field of view they provide. (Inset) The instrument panel with standard blind-flying panel in the middle and radio on the left.

PROMOTOR In the Air

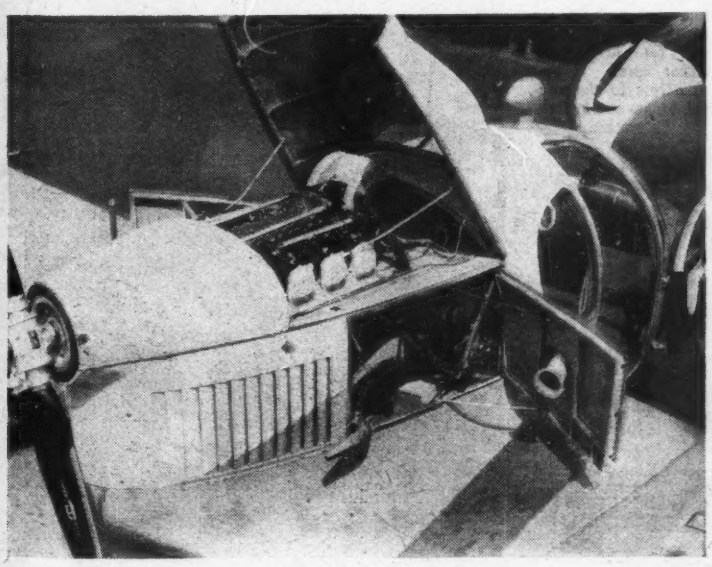
Dutch Four-seater with Some Unusual Features

By Wing Cdr. Maurice A. Smith, D.F.C.

IT seems to be the custom nowadays, particularly abroad, when introducing a new light aircraft, to think of all the duties it could possibly undertake and to tack them on like decorations behind the name. We may see, for example, a brochure dealing with the new "A and B Excellair four-seat tourer, trainer, executive, liaison, observation, ambulance, light freight carrier—also suitable for operation on skis or floats." One is forced to conclude, in some cases at least, that the manufacturers hope to sell their products on high-pressure sales talk rather than merit, and that if the designer had concentrated on producing a machine really suitable for one or two of the functions listed, it might have turned out better.

A pleasant exception to this practice is that of the Fokker F.25 Promotor, made by N.V. Verenigde Nederlandse Vliegtuigfabrieken Fokker i.o. of Amsterdam. It is primarily called a business aircraft, but we might translate this more descriptively as a personal taxi. It was designed as such, and should perform the appropriate duties adequately. An incidental capacity, available for the rare occasions upon which it might be required, and sensibly mentioned in view of the exceptional floor space and large nose and side doors of the Promotor, is that of air ambulance for one stretcher case.

This aircraft is a wide-span twin-boom-pusher type. The cabin must be the most



Illustrated by "Flight" photographs.

The flat-six Lycoming engine is unusually accessible due to the provision of large hinged panels. The cooling scoop is on top, while the carburettor air and exhaust pipes project through the side.

Promotor in the Air . . . . .

roomy for the size of aircraft so far produced, and it reminded me in some ways of the S.51 helicopter. The "chauffeur" sits in a forward seat on his own, and the passengers have a wide three-abreast lounge seat behind him. A central arm folds down if only two passengers are carried. Beside the pilot and forward into the nose is a large expanse of clear floor space which extends across the main entrance door. A folding step is provided, and one can walk in and out of the door almost as if one were entering or leaving a coach.

The whole nose of the aircraft hinges upwards to reveal the nosewheel attachments and retracting mechanism, also the pedals, brakes and hydraulic system. In addition, it reveals a second entry to the cabin sufficiently large for the introduction of a stretcher patient.

Since the prototype appeared at the end of 1946 several alterations have been made as a result of experience on development flights. Differences in fin and rudder shape are apparent, and parts of the engine installation and cowlings have been modified. It had been hoped that an extension shaft to the pusher airscrew could be avoided, and to overcome airflow problems anticipated around the abrupt termination of the nacelle, cooling and exhaust air were fed out through louvres into the air stream over the critical areas. Even so, the airflow was unsatisfactory and a considerable loss of performance was attributed to it. As a result, production Promotors, of which five of the initial batch have been completed, have elongated, more shapely nacelles, and the airscrew is driven through a short extension shaft. Cooling air enters through a scoop integral with the top nacelle panel, and after passing over the cylinders it is exhausted through horizontal louvres somewhat similar to those on the prototype.

The Promotor is predominantly of wooden construction but there are certain metal units. The one-piece ply-covered mainplane is all of wood except for the tip units which are of light alloy. The ailerons are also wooden structures but the hydraulically operated landing flaps are light-metal units. The fuselage is of wooden construction with the exception of the metal nose and the engine nacelle. Fireproof materials are used for cabin trimming and upholstery. The twin tail booms and integral fins are all metal, but the tailplane and elevator spanning them are of wood.

A welded steel tubular mounting structure supports the Lycoming engine, which is fitted with an automatically-variable-pitch Aeromatic airscrew. The 45-gallon Goodyear Pliocel fuel tank is in the centre section between wing spars.

The accessibility of the 190 h.p. flat six Lycoming is one of the talking points of the aircraft. The large upper panel of the nacelle, in which is formed the cooling air scoop, is hinged at its front end and opens wide to give access to the whole upper portion of the engine and its mounting. The two main side panels also open to reveal a large compartment into which projects from the top the lower portion of the engine, its accessories, controls, pipes, etc. The engine compartment is divided by a horizontal diaphragm or deck, just below the centre line of the cylinder heads. The only way in which cooling air entering the upper chamber can pass into the lower and out through the louvres is between the cylinders and through their cooling fins.

Although no extractor fan is fitted with this new engine installation, cooling has proved to be very satisfactory. Temperatures very seldom exceed 230 deg C at maximum reading, while the engine manufacturer's limitation is 260 deg. Prolonged taxying down wind on heavy ground is the only occasion when cooling needs to be watched carefully.

A Dowty nosewheel undercarriage is fitted and provides one of the first examples of liquid springing fitted to a light aircraft. The legs are short, and the aircraft is, therefore, near to the ground. This, together with the wide track, makes for unusually good stability on the ground. The nosewheel is steerable through the rudder pedals, and may be connected or disconnected at will.

The Promotor's visit and our flight from Langley airfield was made possible by the co-operation of Dowty Equipment, Ltd., makers of the undercarriage, and the Hawker company.

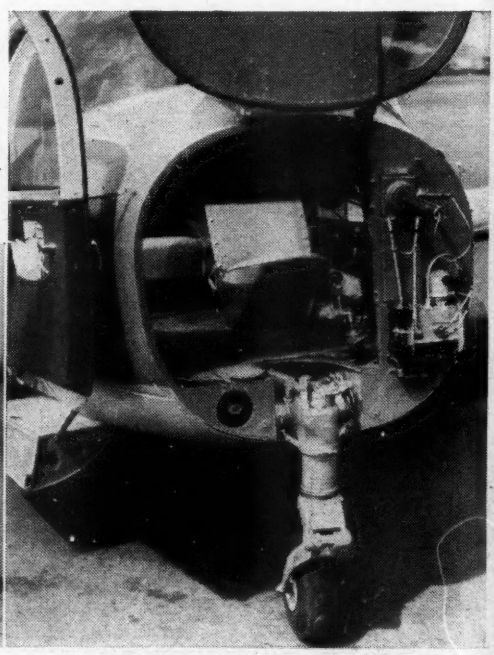
Into the Air

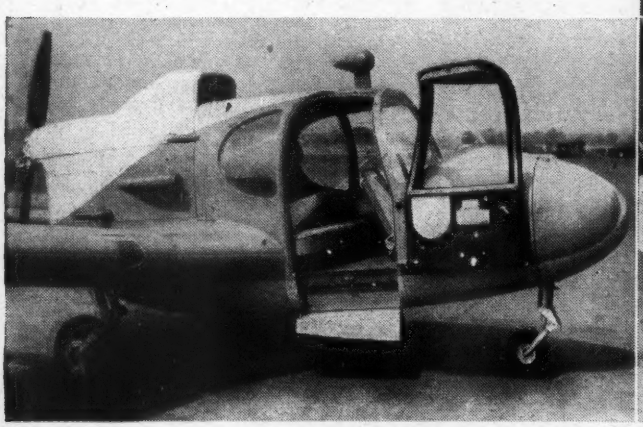
The first thing that impressed me on starting up was the quietness of the engine and the lack of vibration. For a moment I was not sure if, in fact, the engine was running.

No aircraft could be simpler to taxy than a Promotor; the engine can be set at a fast idling speed on the tarmac, the parking brake released, and with control wheel still locked the aircraft can be manœuvred with precision by the use of the steerable nosewheel and a touch of toe brake when particularly sharp turns are desired. The c.g. feels much lower than one would expect, and there is no tendency whatever to heel over, even when sharp turns are made at a fast speed for taxying. The pilot's field of vision is excellent. In view of the car-like handleability of the Promotor when on the ground, the provision of a button to sound the warning horn as an indication of one's approach is a practical feature.

The Promotor's cockpit and interior equipment definitely comes into the "lavish" category. In the centre is a full blind-flying panel, similar to the R.A.F. standard panel in every detail but the type of artificial horizon. Above it is mounted an electric master compass. On the right of this panel is another on which are mounted fuel, suction and engine temperature and pressure gauges, an ammeter and a clock, together with ignition, starting and other electrical switches. Above the wheel, of the push/pull type, is the engine r.p.m. indicator, while below it are the undercarriage and flap controls. To the left are indicator lights and the radio.

Beside the pilot on the left-hand side is a control pedestal which at first sight appears rather complicated but is, in fact, simply a grouping of power controls, trimmers, fuel cock,





Not only is the cabin exceptionally roomy but passengers can step into it like a taxi with the pilot at his controls and engine running. On the right is the open nose-hatch for loading a stretcher case. It also gives access to the nosewheel, brakes and hydraulic system.

heater control, and nosewheel release on enclosed quadrants. The elevator trimmer is a wheel in the vertical plane on the side of the pedestal, its indicator being a small pointer beside it.

The occasion of my flight was one of those rare, extremely hot summer days, and although allowances must be made, it would seem that if the Promotor is to operate in hot or tropical climates additional cabin ventilation would be needed.

Mr. Gerben Sonderman, Fokker's chief test pilot and personal pilot to Prince Bernhard, relaxed in the back seat with another passenger while I prepared to take off. He suggested that, if need be, I should think of him as a talking instruction manual.

After a systematic take-off check I turned into wind, released the nosewheel steering and opened up. I did not detect any tendency to swing on the rather prolonged take-off run, and at a little over 50 m.p.h. I eased the nosewheel off the ground and almost immediately became airborne. A light wind was blowing at the time, and I had used take-off flap, a position indicated by a small yellow tell-tale lamp.

For the first hundred feet until the wheels and flap were retracted climb was rather slow, but the aircraft soon settled down to a very stable initial ascent at about 700 ft/min, with a forward speed of about 80 m.p.h.

Although they are neat and compact, I did not think much of the flap and undercarriage knobs. Their position on the panel below the control column is not particularly convenient, and the need to centre one before the other could be operated would be better avoided by self-neutralizing controls. For hydraulic services of this sort I prefer a small, strong lever with a positive action. The automatic emergency nosewheel steering release, which comes into action when the wheels are retracted, is a sensible fitment.

For the first twenty minutes of our flight I was content to feel the general behaviour of the Promotor while the accompanying photographs were taken, but later I made steep and medium turns to confirm my impressions. First it must be said that the machine is particularly stable in all axes. As far as harmonization of controls is concerned the rudder is rather woolly, while ailerons and elevators are rather heavier than I would have thought necessary on this type of aircraft. However, they are pleasant enough and the aircraft is quite large, being, in fact, in the Proctor class. The rudder hardly needs to be used in normal flight as the machine turns quite accurately on wheel alone and only needs checking for skid and slip on quick changes of direction. The elevator trimmer might well be higher geared to give more effect for small movements.

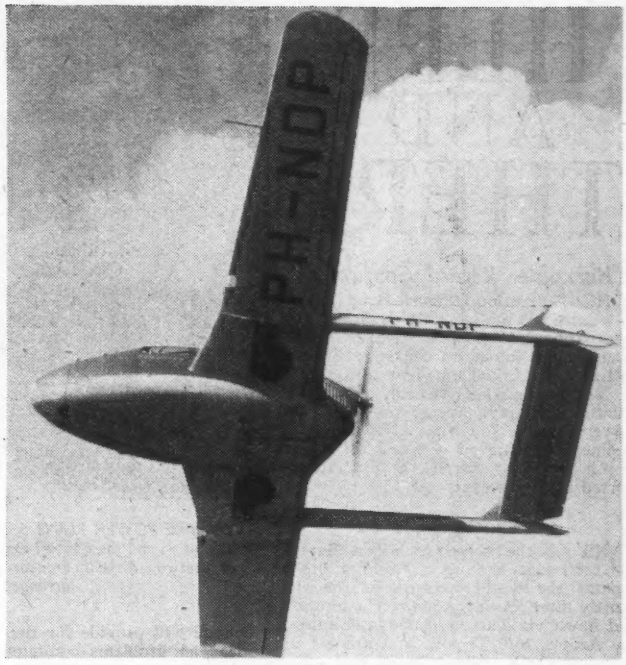
The Promotor is at its best on cross-country flights, the purpose for which it is built. The view for pilot and passengers is quite exceptional, the comfort is of a high order, while the noise and vibration levels are low. The stability already mentioned reduces the work of the pilot to little more than that of a "look-out." The cruising speed at 2,200 to 2,300 r.p.m. was in the region of 110 m.p.h. I.A.S.

Like most modern aircraft in its class, this machine has a viceless stall. There is no particular warning of its approach other than the general wallowing tendency and lack of elevator control. Ailerons continue to have some effect after the sink has commenced. From all normal attitudes the stall is gentle and more or less straight, but if the nose is pulled up high there is a more pronounced wing drop. With flaps and wheels up the stall occurs at about 58 m.p.h., with load a few hundred pounds under the maximum. With engine-off, flaps down the stalling speed is about 50 m.p.h. Fokkers are another company sensibly to add their name to the list of those who use the coloured quadrant system around the A.S.I. dial for indicating the correct speeds of operation.

FOKKER F.25 PROMOTOR DATA

190 h.p. (2,550 r.p.m.) Lycoming O-435-A Flat Six

Span	39ft 4in
Length	28ft
Height	8ft 8in
Wing area	193 sq ft
Weight empty	2,115 lb
Total weight	3,140 lb
Wing loading	16.3 lb/sq ft
Power loading	16.5 lb/h.p.
Max speed at S.L.	141m.p.h
Cruising speed at 3,300ft at 60 per cent power	115 m.p.h.
Range with full tank (44 gal)	590 miles
Stalling speed	53 m.p.h.
Climb to 3,300ft	6.2 min
Climb to 6,550ft	15.1 min
Service ceiling	11,150ft
Take-off run, zero wind, over 50ft obstacle	590 yd
Landing run, zero wind, over 50ft obstacle	385 yd



The unusual wing form and wheel retraction is apparent in this peel-off picture. The airscrew spinner had been removed.

Before returning to Langley I put the Promotor into a medium dive to feel the controls at speeds between 150 and 170 m.p.h., which is nearing the speed limit set for the machine. All the controls remain quite pleasant to use, and the coarse-pitch stop of the automatic v.p. airscrew was reached at about 150 m.p.h. downhill.

At about 90 m.p.h. on the approach to land I lowered the wheels and then selected take-off flap position. The Promotor retained its speed well at about 100 m.p.h. throttle back, until wheels and flaps were lowered, which would seem to indicate a clean exterior in spite of the rather low cruising and maximum speeds attained. It may be that there was some small error in the A.S.I., as I think it unlikely that the maximum speed was higher than 130 m.p.h., whereas the makers' figure is 141 m.p.h. The absence of the airscrew spinner could hardly account for the discrepancy.

Coming in for the final approach I selected full flap and found that as much as quarter throttle was desirable to prevent the rate of descent becoming uncomfortably high. The best speed seemed to be about 75 m.p.h., dropping to 65-70 m.p.h. over the boundary. The landing was surprisingly easy, and the excellent vision from the cockpit was particularly appreciated. As far as I know, I flew the Promotor on to the ground at approximately 55 m.p.h., the nosewheel touching down at the same time as the main wheels. Although it is customary with some nosewheel aircraft to land tail down and later rock forward on to the nosewheel, I am told that the three-point touch-down suits this machine best. Certainly the arrival was perfectly comfortable.

It would have been possible to come to a standstill quite quickly by making heavy use of the brakes, but as there was no reason for this I allowed the machine to roll on and found it kept quite straight without any assistance from controls. The liquid-spring undercarriage behaved very well, but seemed to me to be slightly on the hard side for the well-baked grass runway. It is understood that Dowty's intend to soften the springing. Having come to a standstill and retracted flaps, I engaged the nosewheel steering and "drove" back to the tarmac.

Charter companies operating the Promotor as an air taxi would find their passengers very agreeably surprised by the comfort and convenience of travel in this sort of aircraft. As no direct competitor is built in Great Britain a limited number of import licences could probably be obtained. Sales to private owners are handled by Fritz Diepen Vliegtuigen N.V., Ypenburg Aerodrome, Rijswijk (The Hague).

HERE AND THERE

Helicopter Record Confirmed

THE Federation Aeronautique Internationale has officially confirmed the international helicopter speed record over a three-kilometre course set up by S/L. B. H. Arkell on June 28th, 1948, at White Waltham Airfield, Berkshire. Piloting Fairey Gyrodyne G-AIKF powered by a 500 h.p. Alvis Leonides engine, he achieved a speed of 124.31 m.p.h (200.0657 km/h), as already reported in *Flight*, July 1st.

Superfortress Crash

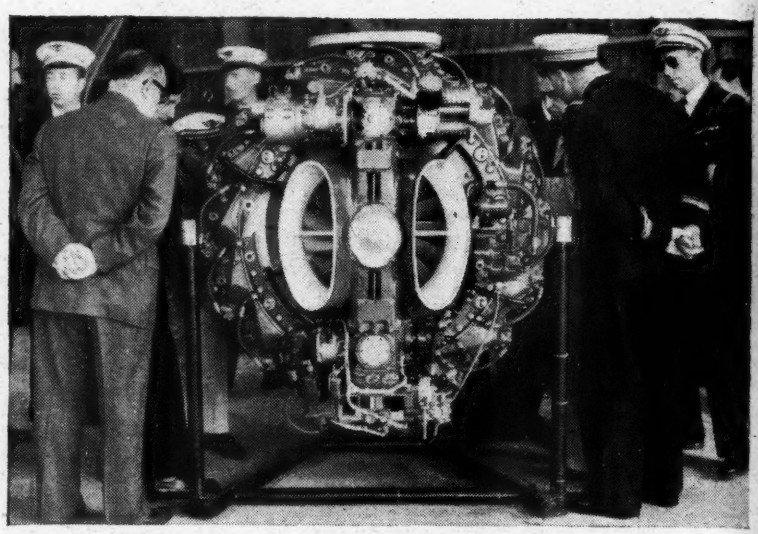
ONE of the three American Superfortresses making a training flight around the world crashed in the sea shortly after leaving Aden. The aircraft had flown via Tucson, Arizona, Florida, the Azores, and Tripoli, and arrived in Aden on July 26th. There was only one survivor of the crew of 17 or 18 believed to be on board.

B.E.A. Route Maps

FOLLOWING the practice of B.O.A.C. who supply for the interest of their passengers maps of the routes over which they will fly, B.E.A. are providing similar maps for their passengers prepared by Francis Chichester, 9, St. James's Place, London, S.W.1. These maps show leading features of the route and include illustrations in miniature of the industries and historic buildings which lie along the route. Printed in colour and with notes referring to the illustrations, these well-produced maps are in folder form and very easy to handle.

Research for the Services

AN Inter-Service Metallurgical Research Council has been set up by the Admiralty and the Ministry of Supply to advise on metallurgical problems of importance to the Services. This council will provide for the exchange of ideas on problems common to the different Services, and will avoid overlap between their research programmes. It should also ensure that the research necessary for the provision of new alloys is undertaken. A number of distinguished metallurgists of the Admiralty, Ministry of Supply, Universities, industry and other Government Departments will serve on the council.



VAMPIRE POWER PLANT: The Goblin Mark II which powers the Vampire Mark V was exhibited, and the aircraft itself was demonstrated to the French Air Ministry on July 22nd, at Bretigny Airfield, France. The exhibition was sponsored by the Ministry of Supply and arranged by the de Havilland Aircraft Company.

Releases Postponed

TO ease the drain on manpower in the R.A.F. caused by the Berlin air lift, 2,400 other ranks due for release in August and September next are to be retained for an indefinite period. They will be released as soon as the situation eases. The trades affected, together with release group numbers, are as follows: Cooks (75 to 76), Drivers, M.T. (73 to 76), Equipment Assistants (72 to 74), Radar Fitter, Air (72 to 75), Radar Fitter, Ground (73 to 75), Wireless Operator Fitter (75 to 76), Clerk, G.D. (73 to 74). Those affected by this announcement—which excludes aircrew and ground staff officers who have been serving overseas—will continue to be repatriated to the United Kingdom as before and serve on home units.

Canadian Jets

THE formation of a Royal Canadian Air Force unit to train fighter pilots in operation tactics has been announced. Air Marshal W. A. Curtis, Canadian Air Chief of Staff, said that the first of two regular interceptor fighter squadrons would be in existence in a year and by next spring the first all-Canadian warplanes—two-seater jet-powered long-range interceptors—should be delivered. The new type would not, however, completely replace the Vampire.

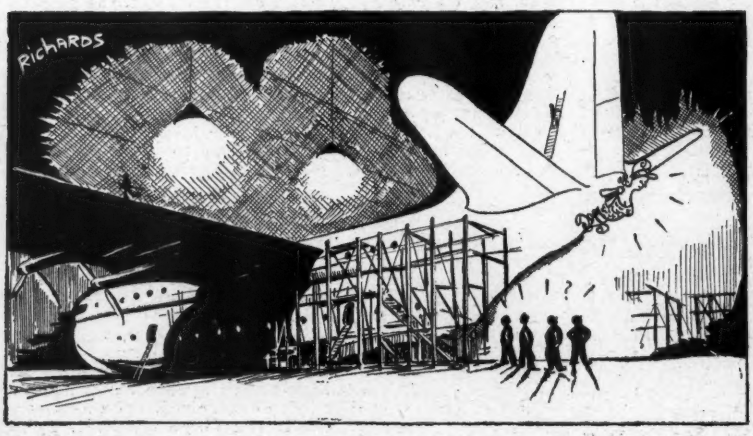
A.T.C. Rally

A RALLY of 1,500 A.T.C. officers and cadets from all over the country will be held at R.A.F. Halton this week-end. The 25 Canadian Air Cadets here on a three-week exchange visit will also be present.

Highlights of the rally will include an inspection of the massed parade and a talk by Marshal of the Royal Air Force Lord Tedder, Chief of the Air Staff; an afternoon flying display, including formation flying, aerobatics and parachute jumping from a static balloon; and the Corps' Athletic Championships, all on the Saturday. These afternoon events may be attended by visitors and parents. The Corps' Swimming Championships will be held to-morrow evening.

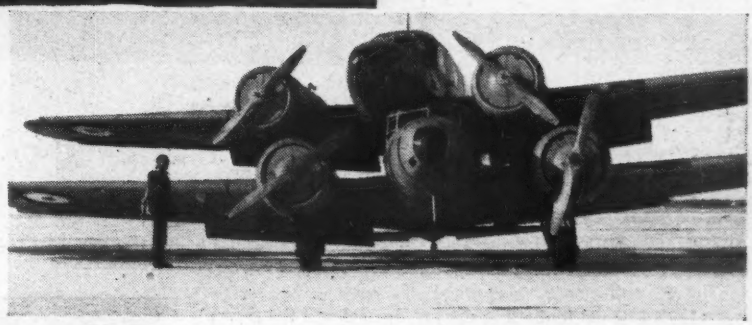
Gliding at Langley

IN the half-year to date No. 125 Gliding School, A.T.C., at Langley, has made 2,688 launches—that by operating only one day a week. During the six months 36 cadets were brought from the *ab initio* stage to proficiency and all were taken a stage further to qualify for the Royal Aero Club "A" certificate and badge. Five officers and instructors were brought to thermal soaring stage and three more to circuit stage. Three instructors have taken a course in winch-driving.



"Nice for the old lady to ride with her back to the engines. She can stand 25g that way."

CANADIAN CAPERS: These two spectacular "prangs" will no doubt carry the minds of some readers back to the days of intensive pilot production under the Commonwealth Air Training Scheme. The R.A.F. Stearmans merged at Bowden, Alberta, and the R.C.A.F. Ansons got together at Gimli, Manitoba. Damage was slight in both cases, and no-one was hurt. In contrast to the wide-open Stearman originally used for elementary instruction in California and Florida, the 330 h.p. Jacobs engines of the Anson II are heavily winterized.



HERE AND THERE

Ypenburg Contest

THE Second International Squadron Flying Contest for the Ypenburg Cup this year will form part of the celebrations at the Hague to commemorate the founding of the city 700 years ago. The date of the contest, organized by the Royal Netherlands Aero Club, was to have been August 8th but this has now been altered to September 12th. Participants are expected to arrive at Ypenburg airfield on September 11th and an official reception and banquet have been arranged by the Hague Municipal Authorities.

New Norwegian Seaplane

SUCCESSFUL tests have been completed with a new seaplane called the C5, constructed by the Norwegian Company Wideroes Flyselskap. Built at Fornebu, near Oslo, this aircraft has been specially designed by Birger Honningstad for Norwegian conditions, and is powered by a 320 h.p. engine. Capable of carrying five passengers, the C5 can also be fitted up as an ambulance, there being a large door on each side of the fuselage to enable a stretcher to be taken aboard easily.

Timken Expansion

THE expansion of the resources of British Timken, Ltd., undertaken to meet the home demand for tapered roller bearings and to enable the firm to obtain a substantial share of export business, is now almost completed. A show day has been arranged for August 28th, and in conjunction with this a series of Conferences, to be attended by representatives of 30 different countries, has been organized.

Dutch Honour

H.R.H. PRINCE BERNHARD OF THE NETHERLANDS on July 27th presented G/C. C. S. Morice, D.S.O., M.C., of Dunlop's aviation division, with the insignia of Commander of the Order of Orange Nassau, conferred upon him by Queen Wilhelmina. G/C. Morice commanded No. 121 Wing R.A.F. at Volkel in 1944 and, states the citation: "through his excellent work he greatly contributed to the liberation of the Netherlands." For helping to establish the first complete airfield after the Normandy landing he received the D.S.O.; in face of heavy enemy shelling the airfield was completely equipped and operating in eight days.

Aero Golfing Society

THE Summer Meeting of the Aero Golfing Society was held on Tuesday, July 20th, at Coombe Hill Golf Club. In the morning competition the Jubilee Challenge Cup, presented by W. A. Bristow, was won by the Society's new Secretary, W. G. Metcalfe (Handicap 6) with a score of 35½ points. The runner-up was P. Q. Reiss (Handicap 7) with a score of 35¼ points. In the afternoon F. Grainger and W. R. Silcock won the foursome competition for the *Aeroplane* Goblets.

Babies Only

PLACED out-of-bounds to all passengers unless accompanied by children, a new baby nursery has been opened by Western Air Lines at Los Angeles airport.

WE still receive occasional complaints from readers who are unable to obtain a regular copy of *Flight*. A small increase in paper supplies now permits most demands to be satisfied, and readers who experience difficulty in obtaining weekly copies through their newsagents should advise the p blishers direct.

Regular subscriptions for postal copies of the journal can again be accepted.

The bay lounge, as it is called, contains full facilities for washing, changing and feeding babies, as well as toys and play pens for older children. The reason given for opening the new nursery is that young children make up one-third of the travelling public to-day.

Nuffield Club

THE paragraph appearing under the above heading on page 55 of *Flight* of July 8th might have been construed as indicating that membership of the Nuffield Club is not required in order to obtain overnight accommodation. The paragraph in question emanated from the Air Ministry, but it is now pointed out by the Nuffield Club that annual subscriptions are still necessary.

News in Brief

A Soviet air designer has recently been awarded a Stalin prize amounting to 200,000 roubles, equivalent to about £9,090, for designing a new type of high power aero engine.

* * *

The price of the standard four-seater Ryan Navion aircraft has been increased by $240. Attributed to increased costs of materials and accessories the increase now brings the cost of this machine to $8,990.

* * *

Aircraft of R.C.A.F. Air Transport Command have begun training flights which will bring machines to this country two or three times a month. The flights, a resumption of a wartime training scheme, will terminate at Lyneham, Wilts.

* * *

The Netherlands Government has purchased fifteen new Harvard trainers from the Canadian Car and Foundry Co., Ltd., who are also overhauling a further ten Harvards supplied to the Dutch by de Havilland Aircraft, Toronto.

* * *

The Secretary of State for Air, the Rt. Hon. Arthur Henderson, K.C., M.P., recently flew to R.A.F. Station, Scampton, to see the B.29 Superfortresses of the U.S.A.F. and to meet the officers and men of the American Group at present based at Scampton for training exercises.

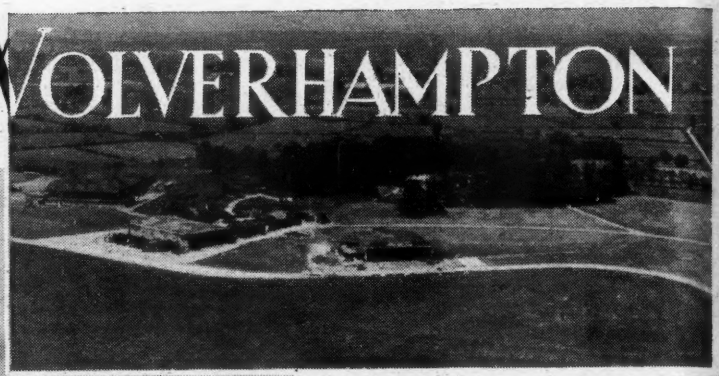
* * *

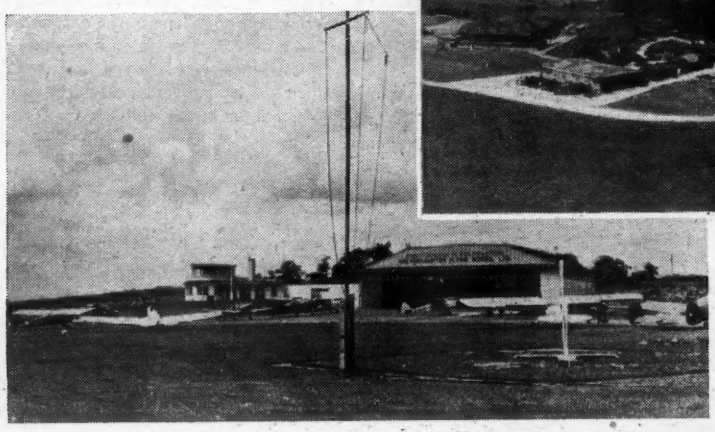
A radio-controlled model aircraft with a range of 2 miles has been built by a Mr. Bassett, a Doncaster garage proprietor. The Radio Control Society are endeavouring to obtain permission to use Barton airport, Manchester, for the testing out of the model.

* * *

We regret to announce the death of Sir Clifford Copeland Paterson, at Watford. Sir Clifford, who was 68, was for 30 years director of the research laboratories of the General Electric Co., Ltd., and won a Faraday medal in 1945.

DERBY and WOLVERHAMPTON





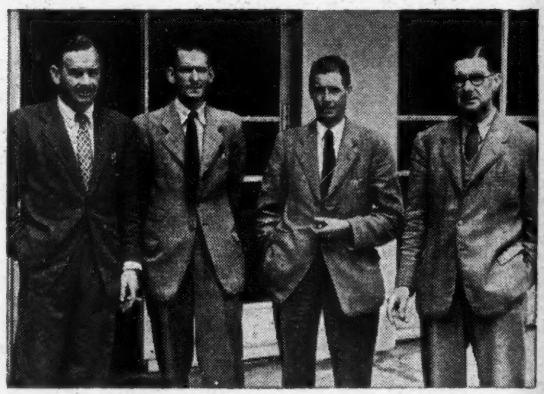
A Brief Survey of the Work of Air Schools, Ltd. and their Associated Aero Clubs

Illustrated with "Flight" photographs

THERE is no doubt that private owners and the flying clubs are at present finding themselves up against all sorts of difficulties and discouragements, but should anyone feel that there is a risk of enthusiasm faltering and of the private flying movement folding up, a visit to Derby or Wolverhampton Aero Clubs would go a long way towards dispelling his fears. The two clubs, together with No. 16 Reserve Flying School at Burnaston, Derby, and No. 25 at Wolverhampton, are run by a common parent company, Air Schools, Ltd., who also manage the airports for their respective municipalities and, in addition, have important charter and repair sections. At Wolverhampton airfield, which is shared with Boulton Paul Aircraft, Ltd., and houses No. 45 Reserve centre and No. 1047 A.T.C. Sqn., Air Schools also provide honorary staff for a branch of the R.A.F. Flying Club and maintain its two aircraft.

G/C. C. A. B. Wilcock, O.B.E., A.F.C., M.P.

Air Schools, Ltd., will always be associated with the name of the late W/C. N. R. Harben, D.F.C., founder and manager of the company before the war when it operated the original V.R. school at Derby, war-time C.F.I. of No. 16 F.T.S. and the moving influence in re-forming and re-establishing the company after hostilities ceased. His widow, Mrs. J. Harben, is now deputy chairman, G/C. C. A. B. Wilcock, O.B.E., A.F.C., M.P., being chairman. Mr. E. W. Phillips is managing director and W/C. H. A. Roxburgh, A.F.C., aviation director. Mr. Phillips has been secretary of the company from the start, Mrs. Harben is also president of the Derby Club, and W/C. Roxburgh is the Chief Flying Instructor of the V.R. school.

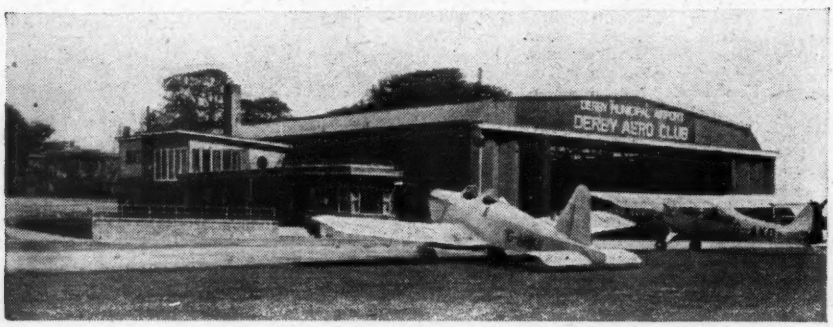


Outside the Wolverhampton club house are seen (left to right) W/C. H. A. Roxburgh, Mr. R. R. Paine, F/L. S. Robinson, and Mr. L. E. T. Barley. See also the left heading picture.

The Clubs

To mention the clubs first, both have the advantage of first-class servicing facilities at moderate cost being available on the spot, as well as good modern club houses and hangar accommodation. This has been an important factor in their rapid expansion. Derby has a flying membership of about 120 and a total membership of 180. The club's fleet includes two each of Austers and Magisters, a Messenger and a Monarch, while private owners account for other Austers, Messengers, and an M.18 and M.28.

Chief instructor to the



Derby club members do not have far to go from their club house to their aircraft. The location of the buildings, hangars and of Burnaston House may be seen in the aerial view of the airport above. The main V.R. and repair hangar with control buildings attached, is on the extreme left.

Derby club is S/L. R. L. Porteous, whose flying displays in Messenger, M.18 (belonging to his wife) and particularly the tiny Chilton, are well known. S/L. George Watson assists with club flying. The chairman is Mr. F. Leeson

Wolverhampton can claim to be in the happy position of having more private owner-members than any other club of its type. Although it was restarted from scratch after the war, there are now no fewer than 41 owners and 220 flying members among a total membership of 270. The aircraft types include a representative variety, predominantly of Miles design, such as Messengers, Geminis, Magisters, an M.28 and the Hawk Speed Six, in addition to various marks of Auster and Proctor. The club has two Autocrats, two Magisters, a Messenger and an Arrow. During 1948 1,314 flying hours were recorded on club aircraft alone.

A. Cdre. John Oliver, A.F.C., is president of the Wolverhampton club and Col. W. H. Binns is chairman. S/L. S. Robinson, A.F.C., the C.I., is assisted by "Tubby" Wild.

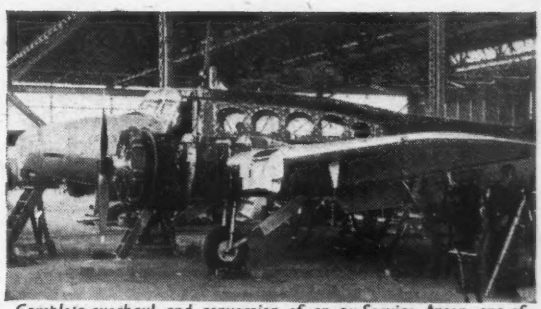
Charter work is undertaken by Air Schools, using a Rapide, two Geminis and an Aerovan. The company's executive aircraft—a Messenger and a Monarch—are also available. Charter activities were recently taken over from another company and have been in operation since June 1st.

Servicing and Conversions

A most important part of the company's work is concerned with airframe and engine overhaul, C. of A. renewal, repairs and conversions of ex-Service aircraft. Facilities have been built up to their present level chiefly during the last two years. From a modest beginning, but one backed with a determination to offer only high-quality workmanship, the volume of work has increased so much that space available, staff and facilities have placed the limit on the amount which can be accepted. The attractive aircraft conversions as well as good servicing facilities offered are, to a great extent, responsible for the success of the club and private-owner activities. Some interesting examples of conversion were examined recently. An ex-Service Auster V, fully overhauled, attractively upholstered in leather, well sprayed externally and complete with starter and standard blind-flying panel and, of course, C. of A., cost its owner £750. A Magister from a similar source, finished in cream, upholstered and ready to fly away, cost £300. An ex-radio-school Proctor III for £400 and a Gipsy Major-Messenger for around £1,200 are other examples. Such prices are not unique, but the high quality of work and materials, coupled with modest price, would be difficult to match.

Crest of the Wolverhampton Aero Club proudly carried on all their aircraft.

One contract worthy of separate mention is the conversion of Ansons into comfortable, finely trimmed, eight-seat passenger machines for use by Blue Line Airways of Nottingham. The interiors, which appear exceptionally roomy, are finished in blue, grey and brown, and large oval windows are fitted.



Complete overhaul and conversion of an ex-Service Anson, one of many such jobs undertaken by Air Schools Ltd.

This work, of which a few examples are quoted, is carried on at both airports, together with repairs and C.s of A. for any aircraft up to Rapide or Anson size. Work was proceeding on a Q.6 at the time of our inspection, in addition to Dominies and Ansons. Mr. R. R. Paine and Mr. A. W. Webb, the chief engineers at Wolverhampton and Derby respectively, are responsible. Both are practical men with long experience and, incidentally, Mr. Paine, who owns the Speed Six, acts as his own test pilot. The technical ground staff now numbers 56, and the proportion of licensed ground engineers to improvers, rather more than one in three, is noteworthy, the usual being about one in ten. Moreover, most of the improvers have five or more years' experience of the work.

V.R. School Management

It would not be appropriate here to give details of the two particular V.R. schools managed by Air Schools, Ltd., except in so far as they exhibit signs of the company's influence. Some experience of a number of the new V.R.F.T.S.s, however, makes one sensitive to the atmosphere at such a unit, and this is almost entirely dependent on the attitude adopted by the management.

At No. 16 R.F.S. Derby nine Tiger Moths are operated, and these are soon to be augmented by Ansons for navigator training. Wolverhampton which, during the war, housed No. 28 E.F.T.S.—often called the "allied E.F.T.S.—and is now the base of No. 25 R.F.S., flv twelve Tigers. The C.F.I.s are respectively W/C. Roxburgh and S/L. L. S. Loveridge, A.F.C. Mr. Lionel Barley is the Wolverhampton manager. The points of interest, however, do not concern the equipment or basic organization which are common to all V.R. schools. What is noticeable is the genuine keenness of all concerned with the V.R. at Derby and Wolverhampton.

The company feels itself fortunate in having a team of enthusiastic young instructors all with A.1 categories. Moreover, the directors do not believe in paring costs by providing barely adequate facilities; food or quarters, or in binding staff and pupils with unnecessary restrictions or a heavy E.F.T.S. outlook. A good spirit, not lacking in enterprise, has made itself apparent, and V.R. pilots can feel that everything is being done to encourage and help them, while their accommodation at the mess in Burnaston House would be envied by pilots from most other schools. Flying hours are nine a.m. until dusk, seven days a week; A.T.C. cadets are given air experience whenever it can be arranged, and training is made as interesting as possible by the inclusion of plenty of cross-countries, formation flying and night flying.

It is to be hoped that such enterprises as Air Schools, Ltd., which are essential units in the civil aviation machine, will soon have their task simplified as they deserve by the grant of official aid more tangible than mere words to the private flying movement.

From his managing directorial office in the control building, Mr. E. W. Phillips, here seen talking to W/C. Roxburgh, has a fine view of airfield activities.

CIVIL AVIATION NEWS

MODERN MERCHANTMAN: A K.L.M. Skymaster is unloaded at Schiphol Airport after a transatlantic flight, the freight being transferred into a train of trucks for transport to other destinations.

The S.B.A.C.'s Letter to the Prime Minister : Berlin Air Lift : British Corporations' Statistics

LONDON'S AIR TRAFFIC

THE month of June proved to be the busiest at Northolt airport since it opened in December, 1945. Altogether 48,740 passengers passed through the airport on scheduled air services during June involving 3,264 aircraft movements. Record figures of mail and freight were handled at the airport, these being 228,096 lb and 679,943 lb respectively. The June figures for London airport showed that the scheduled service passengers passing through totalled 35,652, the number of aircraft movements handling these totalling 2,205.

THE CANADAIR ORDER

THE Society of British Aircraft Constructors has sent the following letter to the Prime Minister, and copies to the Chancellor of the Exchequer, and the Ministers of Supply and Civil Aviation:—

"The Council of the Society have considered this afternoon the Government's decision to permit the purchase by the British Overseas Airways Corporation of aircraft built abroad. They wish to place on record with you their regrets at the decision, and, in particular, their fears that it will have serious repercussions on the Industry's export trade.

"The Council recognize that so grave a decision could not have been taken by the Government except for powerful reasons, some of which may not have been revealed to the general public, but, in the absence of full explanation and having regard to the availability within the next year or two of British aircraft in every way comparable with the American design in question, they share the widely expressed bewilderment which has greeted the announcement.

"Evidence of the harm done in the export field is already accumulating. Canadair salesmen are naturally busy in many parts of the world, and there are indications that buyers in Argentina and other South American countries are being greatly influenced as a result of the enormous prestige conferred on the Canadair product by the British Government's decision.

"On July 15th we had the honour to inform you of the terms of a telegram received from the Society's representative in South America, in which he stated that an adverse decision would be disastrous to our hitherto successful export drive in Argentina and to prospects now offering in other South American Republics with dollar shortages. A later report from him shows that leading airline operators in Argentina and Brazil who were considering the purchase of British aircraft have been severely shaken by the British adoption of aircraft built abroad.

"We have also heard that Canadair aircraft are now likely to be acquired for the services of British Commonwealth Pacific Airlines. Moreover, it is unfortunately inevitable that the decision must affect the prestige of the whole of our Aircraft Industry, and make harder the task of selling all types of British aircraft and equipment in the severely competitive buyers' markets now developing."

PENGUIN PANTRY

TO provide a typical setting for demonstrating food and furnishing equipment, a Horsa glider hull has been converted by the General Electric Co., Ltd., in co-operation with J. Lyons and Co., Ltd., to resemble the interior of a modern air liner The conversion was superintended by Airwork, Limited.

The cabin, which is furnished throughout by Latex Upholstery, Limited, and galley are heated, ventilated and equipped by G.E.C. and include their lightweight aircraft fans. The galley fittings include a two-gallon water urn, a grill boiler and their new air circulation oven. This oven has been specially designed in conjunction with J. Lyons and Co., Ltd., for the heating-up of pre-frozen cooked meals and is capable of handling 24 two-course meals in 45 minutes.

The lounge, complete with cocktail cabinet, is installed in the nose of the glider and has been furnished by L. A. Rumbold and Co., Ltd.

AUGMENTING THE AIR LIFT

THE first commercial aircraft to take part in the Berlin air lift were two Lancastrian tankers belonging to Flight Refuelling, Limited. Each aircraft carried 1,600 gallons of petrol and was flown by the firm's personnel. The Lancastrians took off from Tarrant Rushton on July 27th and arrived at Wunstorf airfield in the British Zone the same night on the way to Gatow airfield at Berlin. The British Air Charter Association, Limited, have advised the Air Ministry and Mr. Bevin, in response to the latter's appeal to the Dominions for aircraft, that there are between 130 and 150 two- and four-engined aircraft with a total carrying capacity of about 400 tons belonging to charter companies which might be useful to reinforce the operation of supplying Berlin by air. It might not be possible except in dire emergency to switch all these aircraft from their normal work, but a large proportion of them could doubtless be brought into use at fairly short notice. The charter companies feel that if they were organized for use in a national or international emergency they could supply a valuable potential of between 400 and 500 aircraft, many highly trained

pilots and mechanics, radio operators and ground personnel, which would greatly supplement the R.A.F. and assist them in maintaining and increasing the flow of essential goods to Berlin.

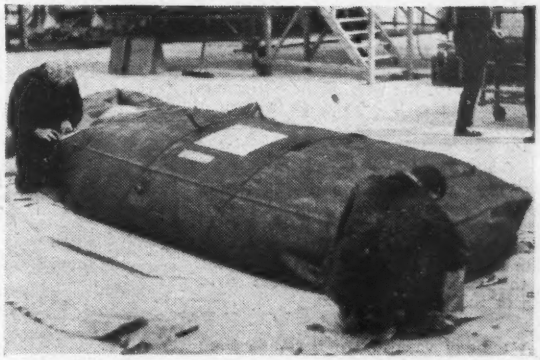
T.W.A. DOMESTIC SERVICE EXTENDED

TRANS World Airline Constellation service in the U.S. has now been extended to include Philadelphia and Pittsburgh; this brings the number of United States cities served by these machines up to ten. Two new Boeing Stratoliner flights and two DC-3 flights are included in the company's new schedules, which give a total now of 113 passenger flights daily. The revisions have been introduced to enable T.W.A. to cope with the heavy volume of summer holiday traffic and to provide increased service for travellers to and from the Democratic Party's Convention which began at Philadelphia early last month.

BRITISH CORPORATIONS' OPERATING FIGURES

TRAFFIC statistics for the three British corporations have been released comparing the activity during April, 1948, with the same month of 1947. The aircraft miles flown by the three corporations show an increase of 25.7 per cent; the passenger miles increased by 39 per cent; mail ton-miles flown by 19.7 per cent and freight ton-miles by 76.4 per cent. A marked increase in freight ton-miles was flown by B.O.A.C., from 405,000 in April, 1947, to 812,000 in April, 1948; this is partly due to the introduction of freighter services on the Australian and South African routes. Figures for B.E.A. showed a decrease from 66,000 to 47,000 mail ton-miles flown, and this is accounted for by the falling off of troop mail carried on the Central European routes. The use by B.E.A. of larger aircraft for their internal services has resulted in a reduction of 20 per cent in aircraft miles flown but a passenger mileage figure which has risen from 6,467,000 to 10,629,000, i.e., 53 per cent compared with the same month in the previous year; the average number of passengers per internal flight has risen from 4.6 to 8.7.

AMBASSADOR AT NORTHOLT: The prototype Ambassador recently flew to Northolt where it was inspected by B.E.A. officials. Mr. P. E. Gordon-Marshall was met by Mr. J. V. Wood, managing director of B.E.A. Other persons in the group are: (Left to right) Capt. W. Baillie, Capt. J. W. G. James, chief pilot of B.E.A., Lt. Cdr. G. O. Waters, O.B.E., general manager of B.E.A., and Mr. J. H. Keeling, deputy chairman, B.E.A.



BRABAZON FUEL TANK: Manufactured by Fireproof Tanks Limited, the picture shows the self-sealing wing tank for the Brabazon, the cover of which is being replaced after modification.

BREVITIES

IT has been officially announced in Wellington, New Zealand, that a group of British civil aviation experts are expected to travel to New Zealand to advise on the economic running of its airlines and on organization of the New Zealand Department of Civil Aviation.

* * *

Five race-horses, valued at nearly £9,000 were recently flown by T.W.A. from Paris to New York. Special stalls had been built in the aircraft for the horses which were under the supervision of a French groom and a T.W.A. cargo attendant. The flight was made without incident.

* * *

In reply to a question in the House of Commons, Mr. G. R. Strauss, Minister of Supply, stated that no sale of jet engines or jet-propelled aircraft to the Spanish government was contemplated. Answering a further question, he said that no inquiry had been received from the government of Spain, but there had been some inquiry from a private Spanish firm.

* * *

I.A.T.A. has recently passed resolutions to the effect that the present basic fare between New York and London, due to expire at the end of August, should continue until March 31st, 1949. The fare is now $350 with a ten per cent reduction for the return flight, and it was originally planned to reduce it to $325 on September 1st.

* * *

Sir Harold Hartley, chairman of B.O.A.C., left Southampton on July 27th in a Plymouth flying boat to visit marine air stations along the B.O.A.C. route to South Africa. Before leaving he denied rumours that flying boats would be replaced by Canadair Fours on this route. It was not expected, he said, that there would be any change-over until the Hermes came into service.

* * *

The number of passengers carried by T.W.A. on its domestic routes during June and the amount of passenger revenue earned during the month establishes a new all-time record for the company. The 123,299 revenue passengers carried represented a 10 per cent increase over the previous month and 77 per cent over February, 1948. The revenue of the company rose by 8 per cent above the May figure and 49 per cent over the February figure, amounting to a total of $4,643,928.

* * *

International Aeradio, Limited, are investigating possibilities of further development in a number of countries in the Middle and Far East. Commander Kenneth Kemble, commercial manager of the company, arrived in Cairo on July 26th and will shortly proceed to resume negotiations already initiated with the governments of India and Pakistan. Commander Kemble is also to visit Bangkok and Rangoon, after which he will go on to Australia via Singapore. International Aeradio, Limited, already hold the sole concession from the Burmese government for the provision of Aeradio facilities.

* * *

Using Convair 240s, a new air service was inaugurated in Latin America by Pan American World Airways last month. The new machines are now exclusively being used on the Miami-Havana route and are replacing DC-4s for the daily service between Miami and Bermuda. One of the first machines to be launched was christened *Clipper Bahamas* by

Civil Aviation News . . .

Lady Murphy, the wife of the Governor-General of the Bahamas, at a formal ceremony at Nassau to mark the opening of the new service.

* * *

An agreement between the U.K. and Canada has been concluded providing for an air service to be operated by T.C.A. between Canada and the Bahamas. No date has yet been fixed for the starting of the service; Nassau is expected to be one of the terminal points.

* * *

A ten-day vacation to Bermuda from New York with all expenses paid has been offered through travel agents by Pan American Airways. Included in the price of less than £60 is the return fare on a Constellation, accommodation at an hotel for ten days, including meals, an all-day yacht cruise, unrestricted use of a bicycle and payment of those taxes which are applied to travel in America.

* * *

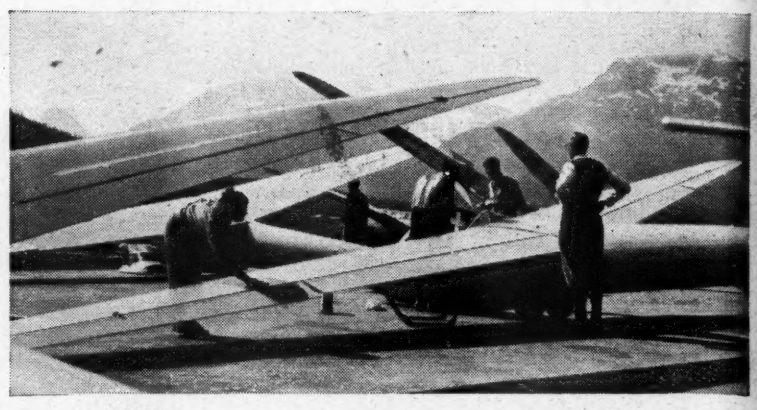
Passengers travelling on Indian National Airways' services to connect with other airlines have hitherto been granted the higher baggage allowance of the foreign operators, provided the gap between disembarkation and re-embarkation did not exceed 72 hours. I.N.A. announce that this time limit has now been extended to seven days.

* * *

Canadian Pacific Airlines will, if negotiations now proceeding for traffic rights in the Pacific are successful, operate two international services, to Australia and New Zealand, and to Asia by way of Alaska. The international routes have been operated by T.C.A. but it is understood that T.C.A. are too busy with domestic and transatlantic services to handle the traffic in the Pacific area.

* * *

Controversy over the correct designation of Sydney's principal airport now seems to be settled by a ruling of the Australian Department of Civil Aviation. Originally the name Kingsford Smith airport—in honour of Sir Charles Kingsford Smith—was approved by the Australian government, but this title, it was pointed out, would be unwieldy, if not misleading, for operational purposes. For operational purposes the use of the term "Mascot" has now been approved by the Director-General of Civil Aviation, but for all other purposes, i.e., correspondence, the original designation is still correct.



ALPINE GLIDING: A scene in Samedan, Switzerland, showing members of the International Gliding teams and their aircraft. On July 22nd the 100 km. triangular flight contest was won by Sigbert Maurer of Switzerland in 1 hour 26 minutes 11 seconds. Reference is made to the tragic death of two of the British competitors on page 163.

FROM THE CLUBS

MONTHLY social evenings at the Leicestershire Aero Club will in future be held on the second Saturday of each month beginning on Saturday, August 14th. Suppers will be served from 7 p.m. onwards.

* * *

TEN new members flew with the Cambridge Aero Club during June, among them Sir Alan Cobham whose son is a member and recently made his first solo after 6 hours of dual. A total of 127 hours were flown during the month.

* * *

MEMBERSHIP total of the West Riding Aviation Centre now stands at 329, and the hours flown in June by the Centre's aircraft amounted to 329. Their Proctor G-AIHH is now fitted with dual control and is available for dual or solo at £5 an hour.

* * *

IN Australia the Civil Aviation Department has written to the Royal Victorian Aero Club expressing serious concern at the accident rate on club aircraft which is alleged to be the highest in Australia. Miss F. Thompson was recently elected to be president of the club; this is the first time a woman has been made president of an Australian flying club. She owns and flies her own machine and piloted an aircraft out from England when the London-Melbourne centenary race was taking place.

* * *

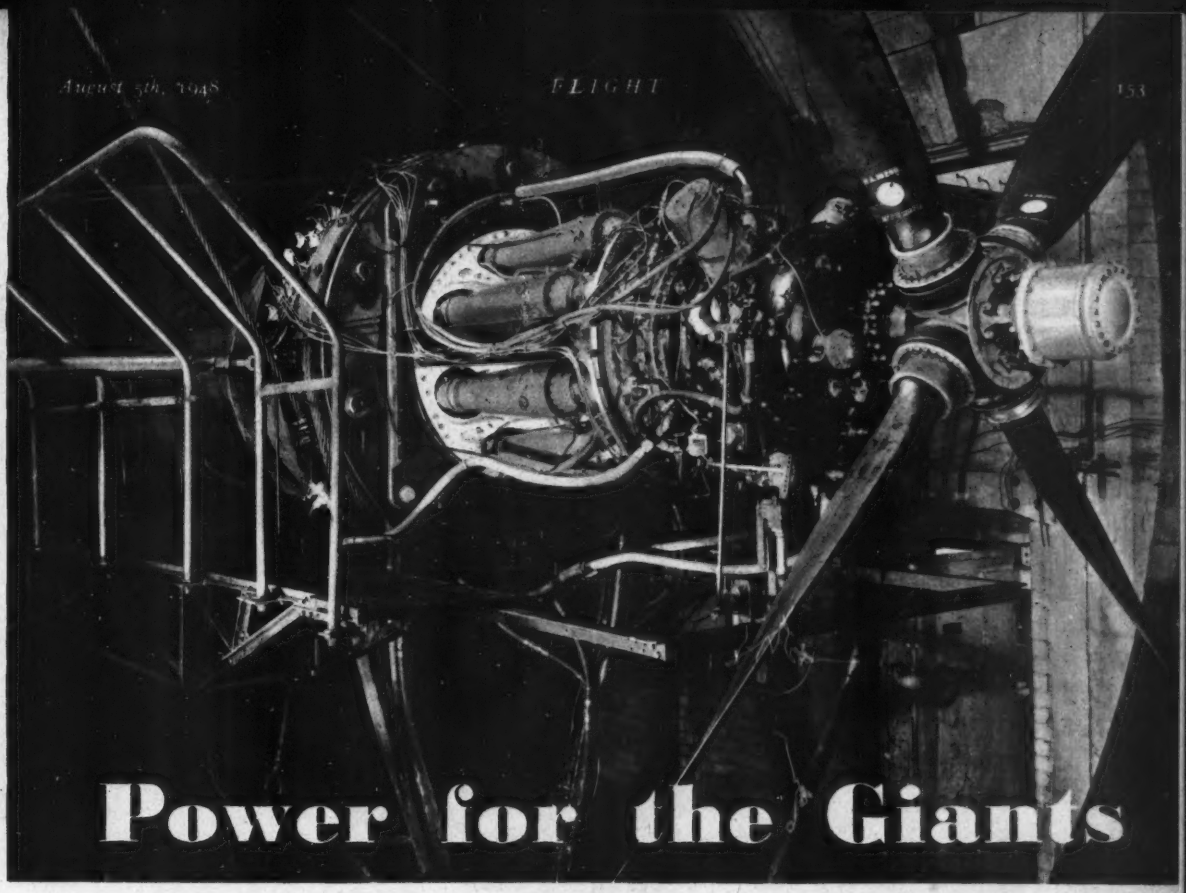
THE Southend Flying Club held an "At Home" on July 17th which was attended by 30 visiting aircraft from all the main flying clubs in the country. Twelve aircraft managed to avoid the defence patrol and arrived at Southend without their registration letters having been taken. Overloading of the restaurant on that day necessitated free tea vouchers being forwarded to pilots and crews of aircraft which successfully evaded recognition. Seventeen of the visitors took part in the competitions arranged. Mr. Arch, of the Midland Flying Club, in an Auster G-AHVS, won the landing competition, Mr. Schofield of the same club, also in an Auster, taking second place. The bombing competition was won by Mr. Maguire of the Denham Flying Club and Mr. Whittaker of the Yorkshire Flying Club was the runner-up; both were flying Austers. The balloon bursting competition was won by Mr. Gregory of Sleaford, Mr. R. M. Young of the Southend Flying School coming second. Mr. Jeffs of the British Aviation Insurance Company, Limited, Langley, won the sealed time of arrival competition in a Messenger. The aerodrome manager, Mr. Collins, entertained the crowd with aerobatics in a Magister and the C.F.I. of the Southend School, Mr. Barnes, gave an alarming display of crazy flying in a Tiger Moth.

* * *

IN a message from Lord Pakenham to the Redhill Flying Club on the occasion of the issue of the first number of the Redhill Flying Club Gazette, the Minister of Civil Aviation said that it was an encouraging sign that, despite difficult times, flying clubs were showing such determination to stand on their own feet and to solve their problems. A contributor to the first number of this excellently produced magazine draws a somewhat unfavourable comparison between the hospitality extended to visitors by private flying clubs, and the hospitality shown by members of yachting organizations. Whereas the latter, he says, are always ready to extend the secretary's compliments and the club's welcome to visiting members, amongst the flying fraternity the reception has often been found somewhat cold. The first number of the magazine is being issued free to members. Future copies will cost 5s for a full year's subscription.

* * *

THE programme of the "At Home" being organized for August 15th by the Rochester Flying Club contains seven events. These are: a sealed time of arrival competition, a landing competition restricted to aircraft without brakes and to pilots with less than 100 hours' flying experience, to be followed by a similar competition restricted to pilots with more than 100 hours' flying experience. Event No. 4 is a display of individual aerobatics carried out by instructors of No. 24 R.F.S., Rochester. A bombing contest follows with competitors flying over the airfield circle at 500ft into wind; the competitor whose missile strikes nearest the centre of the circle will be the winner. During the tea interval there will be an exhibition of formation flying by trainees of No. 24 R.F.S. The final event which is scheduled for 1730 hours is the "slowest slow roll" competition. This is to be carried out at 2,500ft and the pilot who takes the longest time from the start to the finish of the actual roll will be the winner. Competitors who pause noticeably when inverted will be disqualified. No entrance fees are required for these contests, the first of which is due to begin at between 1415 and 1455 hours



Power for the Giants

Preliminary Description of the Bristol Proteus Turboprop Unit : Brabazon and S.R.45 Coupled Installations in Detail

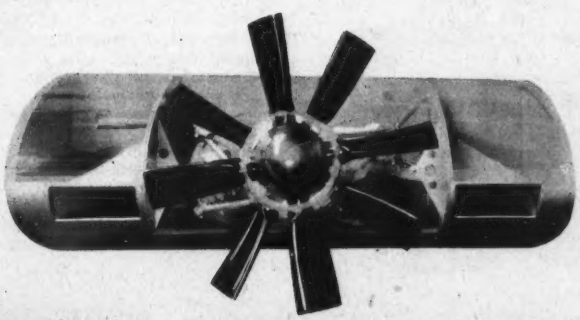
MATCHING in magnitude the structural and aerodynamic problems which attend the Bristol Brabazon I Mark II, landplane and Saunders-Roe S.R.45 flying boat is the task of providing power units for these civil colossi. This can well be appreciated when it is considered that the respective all-up weights will be 130 tons and 135 tons, and that a very high speed and long range is demanded in both instances. Official restrictions have hitherto precluded any detailed appreciation of power plant features, but the release of preliminary information on the Bristol Proteus turboprop now permits description and illustration of how power is being provided by the Engine Division of the Bristol Aeroplane Co., Ltd., and of the manner in which this will be utilized by the airframe designers. Both the Proteus itself and the coupled installation will, we believe, be judged worthy of the Brabazon and S.R.45 designs.

Though in the first instance the Brabazon I is to be air-tested with an installation of coupled Bristol Centaurus reciprocating engines (see *Flight*, December 26th, 1946), subsequent machines will each receive four coupled pairs of Proteus. The S.R.45 will be powered from the outset with ten Proteus units—four in coupled pairs and two individual units outboard. Before surveying the coupled installation, common to both aircraft, all available information on the Proteus itself will be presented, together with some account of development to date.

The Proteus—a unit of roughly 3,500 h.p.—was started up for the first time on January 25th, 1947. Valuable data had already been gained from the testing of the smaller Theseus unit of about 2,300 h.p., which first ran on July 18th, 1945, and which, by December of the following year, had successfully completed the Ministry of Supply 100-hour type test. In Lincoln aircraft the Theseus has since amassed over 600 flying hours and, as lately described in *Flight*, has completed an arduous 500-hour endurance test, during which all major items were sealed.

Though certain design techniques are expressed both in the Theseus and Proteus, the latter unit differs considerably in layout. The compressor is a combined axial and centrifugal unit, centrally located and having the combustion chambers disposed around it. Photographs and drawings

Model of the coupled Proteus installation for the Brabazon.

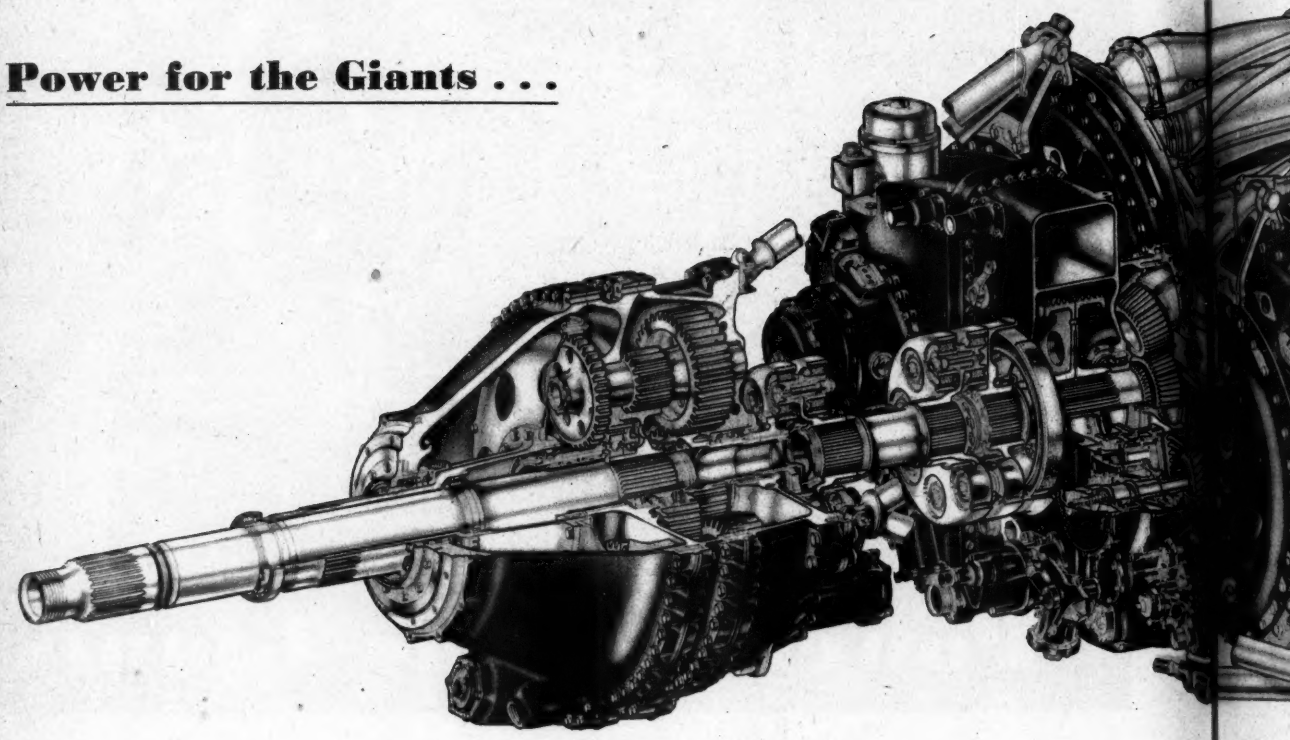


A MATTER OF NOMENCLATURE

TO all but students of Greek mythology the name Proteus will be unfamiliar and its suitability to the new Bristol turboprop unit not, perhaps, apparent. The adjective "protean," meaning variable, certainly does not help to elucidate the matter.

Editorial research discloses that the divinity concerned may have personified the changeable aspect of the sea, and that be held the secret of contrary winds. This knowledge lends a special interest to the terms of the Brabazon and S.R.45 specifications which demand exceptionally long ranges in face of perverse winds.

Power for the Giants . . .

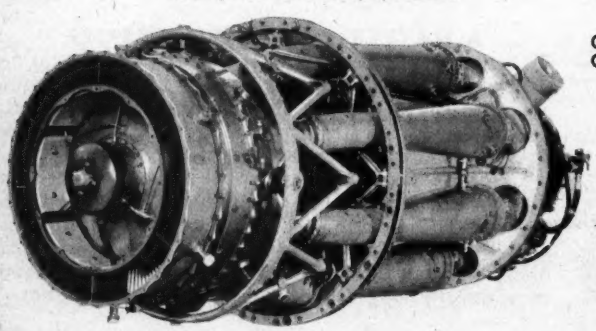


herewith show that air enters at the *rear* of the compressor and traverses the axial stages before passing through the centrifugal stage for delivery to the eight separate combustion chambers. This reversal of airflow direction has enabled a useful reduction of length to be effected. An important feature which is common both to the Proteus and Theseus is the mechanical separation of the compressor and airscrew-driving turbines (both axial-flow), now often referred to as the "free turbine" arrangement. Not only does this result in simplification of the airscrew system, but it makes for easier starting, since a much smaller motor will suffice. Regrettably, fuller information on the power plant proper is still withheld, but there follows a detailed survey of the coupled installation.

The two turbojet units are mounted side by side, with their centre-lines approximately 42in apart, and are attached to the coupling gearbox—a large, three-piece, cast-aluminium casing, which houses the first stage of the transmission gearing, together with various ancillary drives. The gear train comprises a double helical pinion, driven direct by each power-turbine, each pinion meshing with an idler, which, in turn, meshes with a single output gear. Each gear and pinion is supported on ball or roller bearings. The reduction ratio is 3.2:1. Each power-turbine shaft and its pinion is connected through a dog-clutch which can be disengaged hydraulically by remote control should it become necessary to isolate a turbine in such an emergency as turbine failure. The isolating clutch is so designed as to prevent engagement while in flight. Incorporated in the drives from both turbines are torquemeters which depend for their action upon the bearing reaction imposed due to tooth loading, the minute displacement occurring being balanced against a measuring load developed in a hydraulic cylinder.

At the two extremities of the coupling gearbox casing are the electric starter motors for the turbojet units. Through the medium of bevel and spur gears, with the usual claw-type of starter dog, these drive the turbine compressor rotors; the starting sequence, in fact, differs in no way from that normally employed for turbojets. Directly

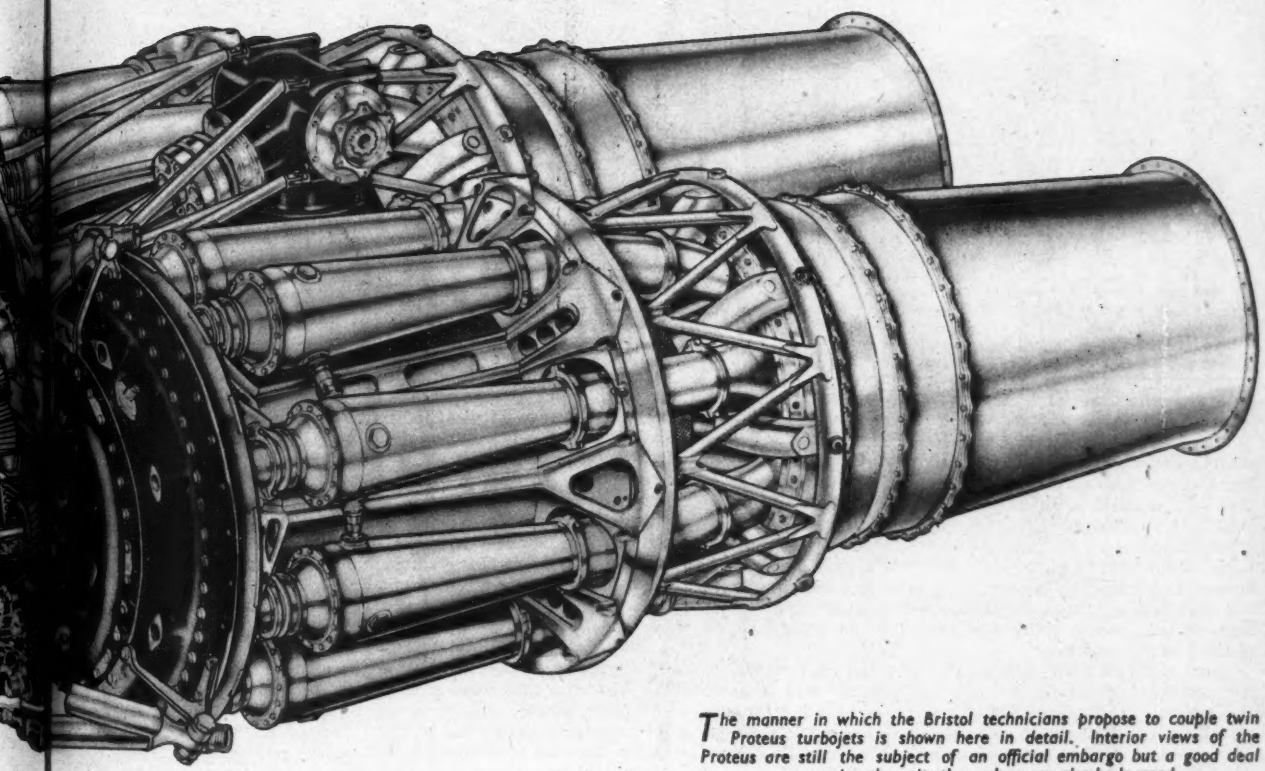
Three-quarter rear view of the Proteus.



BRISTOL PROTEUS TURBOPROP UNIT

Leading Particulars

Overall length	99.75in (exhaust cone removed)
Overall diameter	38.5in
Net weight (dry)	2,900lb
Centre of gravity ...	18.5in forward of mounting ring attachment face
Fuel	RDE/F/Ker. Aviation kerosene. (Specific gravity 0.81)
Oil	Intava 7117 Type "B" (60 second viscosity)
Airscrew shaft size ...	... S.B.A.C. No. 6—R.S.267.
Airscrew rotation ...	... ... Left-hand tractor
Turbine/airscrew reduction gear ratio... ...	... ... 11.11 : 1
Compressor r.p.m. ...	... ... 10,000 maximum
Sea-level static power ...	3,200 s.h.p. + 800lb jet thrust.



The manner in which the Bristol technicians propose to couple twin Proteus turbojets is shown here in detail. Interior views of the Proteus are still the subject of an official embargo but a good deal concerning the units themselves can also be learned.

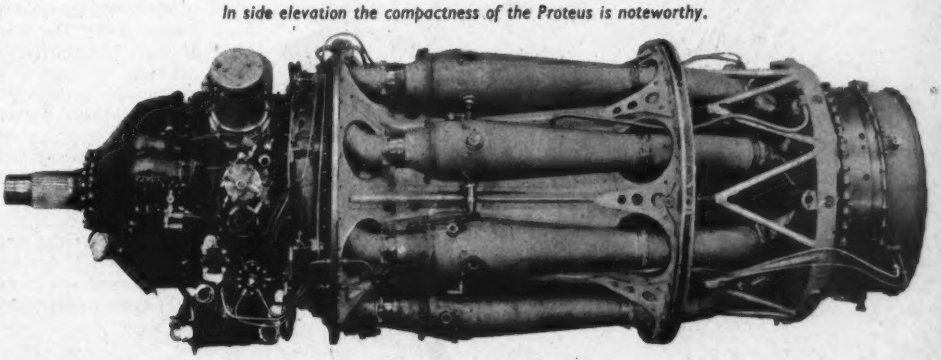
one turbine-compressor unit starts up, the airscrews rotate and the power-turbine of the second unit also rotates. The second starting sequence having brought in the second turbojet unit, the output from this unit is added to that of the first.

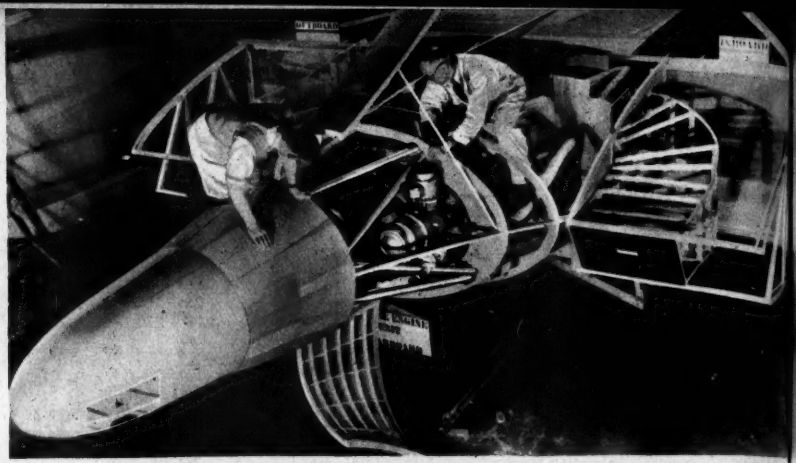
The main output gear is carried on a splined shaft, at the rear end of which is a secondary gear train driving the aircraft accessory gearbox shafting, and the lubricating oil pumps for the transmission gear. For the former purpose there are oblique-angle bevel gears, with the output shaft located above the centre-line and pointing rearwards and upwards. Below the centre-line, a spur gear train drives the main and torquemeter oil pumps, positioned respectively at the front and rear of the main casing. The main pressure pump delivers oil to the lubricating system of the coupling gearbox, the contra-gearbox, and the airscrew system. Two scavenge pumps are supplied for delivering oil via the oil coolers back to the tank—one on the coupling gearbox and one on the contra-gearbox. Other pressure and scavenge pumps (combined units) are driven one by each of the compressor turbines. These supply oil to the compressor auxiliary drives and to the metering pump for the ball and roller bearings. The scavenge oil from these items is returned to a separate tank from that of the main oil system.

In order that the contra- and reduction-gearbox may be mounted as close to the airscrews as possible, the drive from the coupling gearbox main output shaft is extended forwards by means of a tubular drive shaft. This shaft runs at approximately 3,500 r.p.m., and takes the form of a large-diameter tube equipped with a flexible coupling at each end. These couplings are necessary in order to accommodate small degrees of malalignment due to flexure of mountings, etc., under flight loads. A novel feature is a parking brake drum, incorporated with the output shaft of the coupling box. Within the drum are brake shoes, of orthodox type. Brake application is by means of an electric actuator, via a torsion bar spring arrangement which prevents the application of excessive torque loads.

The contra gearbox is built as a complete unit, self-contained in every way except that it derives its oil supply from the coupling gearbox pump. Five layshafts are equally disposed around the common centre line of the input and airscrew shafts, and are carried in plain bearings housed in spiders or diaphragms forming part of the main gearbox casing. Each layshaft carries three pinions. The

In side elevation the compactness of the Proteus is noteworthy.





The low frontal area of a coupled installation is evident above. Right, mock-up of S.R.45 installation

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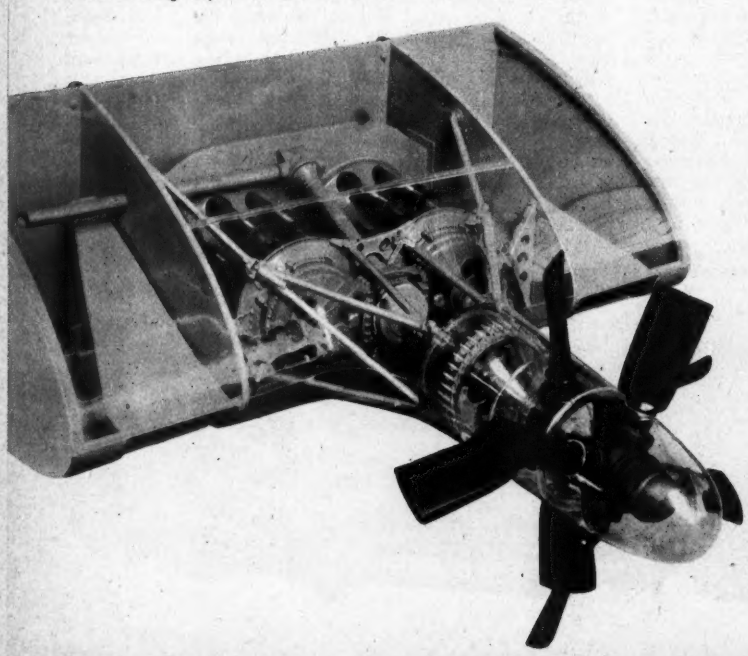
pinion on the input shaft drives the layshafts by the rearmost of the three pinions, while the centre and forward pinions drive respectively the inner and outer airscrew shafts, the latter drive being through the medium of an internal gear of large diameter. Thus the direction of rotation of this shaft is opposite to that of the inner airscrew shaft. The ratio between the input shaft and both airscrew shafts is 3.7 : 1, giving an overall ratio between turbines and airscrews of 11.9 : 1. The whole gear assembly is housed in a cast light-metal casing with a forward-extending nose in which are carried the front airscrew shaft bearings. These are of roller and ball type to accommodate radial and thrust loads.

Since the airscrews have hydraulic pitch change, provision is made for supplying high- and low-pressure feeds to the operating cylinder. For this purpose oil is fed through suitably drilled ducts to an oil-feed sleeve encircling the after portion of the inner airscrew shaft. Seals of axial type are provided round these sleeves in order to prevent the loss of high-pressure oil from the airscrew system.

Drives are incorporated on the rear cover of the contra-gearbox for airscrew ancillaries, comprising a constant-speed unit, braking pumps and synchronising gear.

As previously intimated, the Proteus units are attached (through the medium of the steel centrifugal compressor housing and turbine accessory housing) to the coupling gearbox. A rigid unit is thus formed which at once unites the two turbine units and by which is supported the whole power plant. A triangulated tubular structure, extending forward from this unit, carries the contra-gearbox; thus the complete power plant forms one assembly, which is secured to the aircraft wing by attachments picking up at left and right of the above-mentioned sub-unit. These attachments are so designed as to accommodate all shear and yawing loads. "Nodding" loads are accommodated through the medium of struts attached to the four extremities of the gearbox sub-unit, and extending rearwards to points on the nose ribs at, or near to, the main spar booms. Main attachments to the aircraft structure are so designed as to accommodate expansion of the gearbox in a lateral direction, thus avoiding transmission of stresses from thermal causes to the aircraft structure.

Model showing disposition of twin Proteus in the Brabazon wing.



Accessories

The accessory drive shaft previously mentioned terminates in a flange, to which is coupled a tubular shaft extending upwards and rearwards above the centre line of the complete power unit to a right-angle bevel drive, with lateral shafts extending to right and/or left, towards the cabin blowers and aircraft accessory gearboxes. These lateral shafts are also provided with flexible joints and run at approximately 4,000 r.p.m. Considering a port wing layout, one lateral shaft from the inner power plant extends towards the fuselage and drives the cabin air-conditioning plant, whilst a second lateral shaft extends in the opposite direction to share the drive to the electric and hydraulic gearbox. From the outer power plant one lateral shaft only extends towards the electric and hydraulic gearbox. This accessory drive is provided with free-wheels so that, in the event of one power plant being closed down, the other will continue to drive the accessories, thus ensuring the maximum degree of reliability for the aircraft services under all conditions of flight. Furthermore, operation of the electric generators (or alternators) as motors will permit ground tests of other engine-driven accessories without the need to run a main power unit for this purpose.

Eight-bladed contra-rotating airscrews of 16ft diameter are specified for the Brabazon and S.R.45. The pitch-changing mechanism is hydraulically operated and comprises the usual arrangement of a hydraulic cylinder associated with the forward component of the airscrew, with a translational bearing for operation of the rear component. Airscrew blades are of metal, and are provided with thermal de-icing, deriving their energy from the aircraft electrical system. Normal constant-speed units are used, and braking by means of reversing the blade pitch will be effected by separate braking pumps. Both the constant-speed unit and the braking pump are located on the rear face of the contra-gearbox.

Provision is made for electrical synchronising of the turbojets. For this purpose each Proteus drives a synchronising alternator, of which the frequency of output is a function of speed. Correction of speed is effected by means of a corrector motor of the differential type, deriving its power from the

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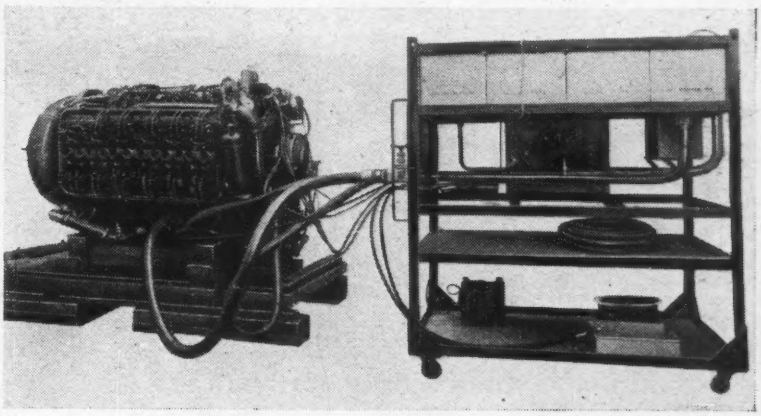
alternator associated with the "master" Proteus, together with that of the unit under control. This motor trims the setting of the constant-speed unit which, in turn, corrects airscrew pitch by an appropriate blade angle change.

Concerning the air intake system, an important feature is the full use made of the airscrew slipstream ram. A pair of intake ducts is arranged (one duct each side of the main power cell) with their inlets in the leading edge, directly in line with the most effective part of the airscrew blades. These ducts extend to a point level with the compressor air inlets, where the flow is reversed through the fire walls towards plenum chambers which completely encircle the compressor air inlets of both units. The main air-intake ducts are of such a design that adequate precautions may be taken against icing troubles and the ingress of foreign bodies. As a further protection against icing, a "sheltered" intake is proposed, in the form of louvres or slots in the power plant access door. In order to maintain the temperature of the power cell at a level consistent with requirements for best efficiency, and at the same time to avoid dangerously high temperatures, an air bleed is arranged from the main air intake ducts.

A great deal of development lies ahead of the Proteus and of the various components which go to make up the coupled installation. Major alteration of the foregoing account, however, is not likely to be called for by the time the S.R.45 and Mark II Brabazon are airborne.

Engine Servicing Trolley

Easy Inhibition of Engines While in Store



The Napier trolley is here shown ready for the inhibition of a Sabre engine.

WHEN an engine is not performing its designed function, but is left static for anything much beyond a purely nominal period, it becomes susceptible to corrosion. During the war, when engines were put into duty almost as fast as they left the manufacturers, the bugbear of corrosion did not obtrude unduly, and even in engines stored at Maintenance Units, the period of storage was usually so short that the incidence of corrosion was negligible. To-day, however, it is entirely possible that, after delivery from the manufacturers, an engine may be stored for a year before being installed in an aircraft, and this has necessitated the most elaborate ritual of defence measures.

It is, of course, quite simple to protect the exterior surfaces of an engine, but to give adequate protection to the more vital and vulnerable interior surfaces is a vastly more complicated problem. For some time now, a committee on which the Services and manufacturers are represented, has made an exhaustive study of corrosion and has issued mandatory requirements for engine protection. These requirements call for the elaborate use of desiccants such as silica gel, applied both to the engine itself and to the interior of the enclosing case.

Some time ago, the Napier company devoted their attention to the effects of corrosion in engines and possible means whereby the aggravation could be lessened. As a result of their investigations, they have developed an apparatus that goes quite some way toward putting the anti-corrosive treatment of aircraft engines on a production-line basis. The apparatus is a compact, self-contained trolley unit which incorporates all the equipment required for dynamically inhibiting engines and which, furthermore, enables this to be done with the minimum amount of dislocation to the engine store or maintenance shop. Whilst the trolley, as designed, is principally intended for the treatment of Sabre engines, it is capable of being used for the treatment of any type of engine with little more adaptation than the provision of suitable couplings.

Trolley Layout

On the top tier of the trolley are four 20-gallon tanks, two of which contain lead-free fuel, a third contains fuel plus inhibitor fluid, whilst the remaining tank contains storage oil. A further tank beneath the last-named unit accommodates two gallons of cylinder-priming fluid. The tanks have large filler caps, and each carries direct-sight level gauges, whilst shut-off and change-over cocks are fitted to the control panel on the trolley. This also incorporates an oil-temperature gauge, cylinder and carburettor priming pumps, starter button, booster and ignition switch, etc. From the control panel, the tank pipelines are run to a grouped union panel at one end of the trolley. Each union is clearly labelled and, in addition to a simple colour-identification scheme, the ends of the various coupling hoses are provided with metal tags indicating the particular service.

The centre and lower tiers form tool and equipment racks and provide convenient space for stowing the drain trays, temporary exhausts, flexible connecting hoses, etc., when transferring the trolley from one site to another. The lowermost tier carries the two 12-volt batteries that supply the electrical services, such as built-in boost coils, cartridge-starter firing, etc. As all the operating controls are grouped in the central panel, it is easy for the trolley to be so positioned relative to the engine that one man may comfortably perform the entire running operation. A small portable auxiliary panel is supplied for attachment to the engine; it provides the requisite engine controls and carries a tachometer, together with oil and coolant pressure and temperature gauges.

The method employed is not only effective but is also very simple. Where a Sabre engine is concerned, the smooth running characteristics and high dynamic inertia make it quite possible to run the engine without an airscrew or alternative flywheel mass, and thus the engine can be run as and where it stands in its packing case on the floor. After removal of the packing case, the engine is run on the fuel and oil supplied from the trolley tanks. After running for a sufficient time to stabilize the operating conditions at the optimum for inhibiting, the cocks are turned over to the inhibitor mix and the engine allowed to run for about five minutes, after which the cocks are shut off and the engine allowed to die by fuel starvation. Thus the fuel and oil become vehicles for carrying the inhibitor into direct contact with the whole of the engine interior, the fuel being used in the process of combustion to leave a protective film. The various supply hoses are then disconnected and the blanking covers replaced on the engine.

This method has the merit that, not only does it facilitate the inhibiting of an engine going into storage, but also has the added quality that, when an engine is withdrawn periodically for a proving run, the same operation also automatically re-inhibits it. As an additional safeguard to the internal inhibiting, if small plugs of silica gel were incorporated in the blanking covers, this should serve quite adequately to cope with any condensation consequent upon large temperature changes whilst the engine is stored, without the provision of large amounts of desiccant as at present called for.

New and not-so-new types in service: (1) Airspeed Oxford, (2) Fairey Firefly 4, (3) Auster, (4) Hawker Sea Fury, (5) Supermarine Spitfire Trainer, (6) North American Harvard.

HOLLAND'S AIR FORCES

Home Industry Concentrates on Trainers : Meteors Ordered

FOR many years Holland has possessed an efficient aircraft industry and, prior to 1939, Dutch factories produced some quite outstanding aircraft, both in the commercial and military fields. The occupation of Holland, however, prevented the Dutch industry from gaining a groundwork of experience in the production of high-speed types, Dutch factories having been utilized for the construction of second-line German machines and components.

The extensive damage suffered by Dutch factories cannot be made good within the space of a few years. Given adequate time, the Netherlands aircraft industry could probably produce efficient military aircraft of national design but, what is not known is whether the necessary time will be vouchsafed. Thus, the time factor makes the adoption of British aircraft especially attractive and, as with other European countries outside the Soviet sphere of influence, Holland has ordered considerable quantities of British machines while her own factories concentrate on the production of training aircraft.

When Holland was invaded in 1940, the major proportion of her aircraft were hopelessly antiquated and the many plans that had been prepared for the re-equipping and modernization of the Dutch air services were far from reaching fruition. Thus, during the few days in which the Dutch attempted to resist German aggression, the 100 or so Dutch aircraft that were then airworthy were set a task that even the high courage of the Dutch pilots could hardly bring to a successful conclusion.

Many Dutch aircrew and ground staff found their way to this country after Holland's downfall, and a number of Dutch squadrons were formed both here and in the Far East. During their subsequent service, the crews gained the operational "know-how" upon which the post-war air forces are being based, and many ex-operational aircrew members are employed in Dutch flying training and technical schools.

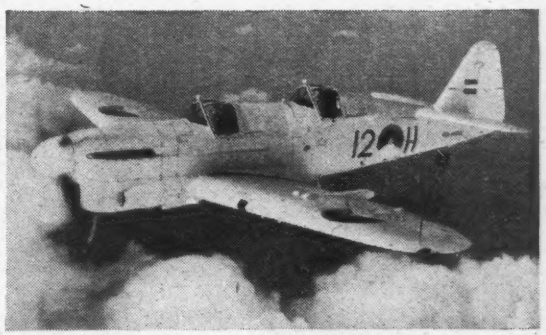
With the liberation of Holland the Dutch air forces gradually took over the airfields that had previously been used by the *Luftwaffe*, and now occupy Eindhoven, Leeuwarden, Deelan, Twenthe, Valkenburg, Gilze-Rijen and Woensdrecht. The latter airfield is used for grading and primary flying training, for which Tiger Moths are employed. Navigational, wireless and air gunnery training is conducted at Gilze-Rijen, advanced flying training for

fighter and bomber pilots at Twenthe, and all technical personnel are trained at Deelan. The Royal Netherlands Navy, the larger Dutch purchaser of British warplanes to date, is not as yet training its own personnel, all such training being undertaken by the Army Air Corps under the guidance of the Directorate of Flying Training.

The equipment of the Army Air Corps consists of a miscellany of wartime aircraft, operation squadrons being primarily equipped with Spitfires of various marks, and North American Mitchells. To replace the Spitfires at present in service, it is intended eventually to use the Gloster Meteor F Mk. IV, and it is possible that the Meteor will be produced in Dutch factories.

The Royal Netherlands Navy has considerably more up-to-date aircraft than those in service with the Army units, having taken delivery of some 65 Firefly Mks. I and IV reconnaissance-fighters and a Firefly Trainer, with a further 14 Firefly Mk. IVs on order. Additionally, the first Hawker Sea Furies have been delivered to the Dutch Navy and will, with the Firefly, form the major naval striking force.

Home production is at present concentrating on trainers, with the prototype Fokker S.11 Instructor undergoing testing at Schiphol and the first production models scheduled for delivery during the next few months. This trainer is of especial interest in that it conforms to the new R.A.F. three-seat formula and augurs well for the adoption of R.A.F. training methods in European countries. The Fokker S.13 twin-engine gunnery, bombing and navigational trainer is nearing completion, and Dutch factories are tooling up for the production of a batch of N.A. Harvards.



A Fairey Operational Trainer (Rolls-Royce Griffon 12) lately delivered to the Royal Netherlands Navy. Seventy-nine Fireflies of various forms are in service or on order.

Recently, the Command of the Dutch Home and Far Eastern army air units has been reorganized and the European and Far Eastern Commands are now combined under the Chief of Air Staff, whose primary task is the co-ordination and combination of all Army Air Units.

Should Eastern and Western Europe eventually take up arms against one another, the general adoption of British operational aircraft by such European nations as Holland, who may have to bear the brunt of the initial attack, may prove a decisive factor during the war's early days.

Bleriot Commemoration

LAST week we recorded details of the most commendable and appropriate flight of the Vickers Nene-Viking from London to Paris and return, in commemoration of the 29th anniversary of Bleriot's historic first Channel crossing. It seems that the idea of recognizing the occasion in this fitting manner can be attributed to Capt. J. ("Mutt") Summers, Vickers' chief test pilot, who flew the Viking. He made the suggestion to Col. Preston, and the idea was passed on to Air Marshal Sir Alec Coryton, who was responsible for ordering the experimental aircraft. Immediate approval was given and planning of the flight was commenced. It was Capt. Summers' idea that he should try to fly from Paris to London in the same time as it had taken Bleriot to fly from Les Baraques, near Calais, to Northfall Meadow, Dover. On behalf of members of the Royal Aero Club Col. Preston sent a letter in the Viking to M. John Bleriot, son of Louis, and his mother. The text of this letter is as follows:—

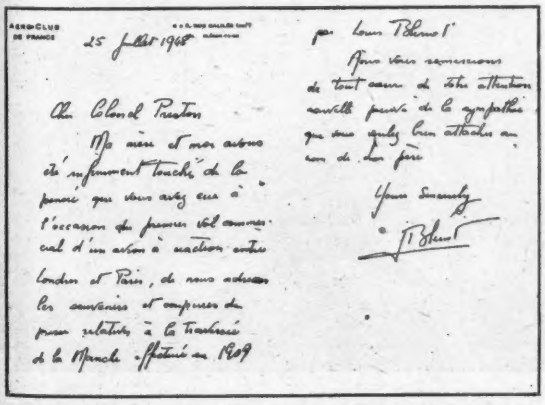
Dear Bleriot,

To-day is the anniversary of a landmark in the history of aviation. On this day in 1909 your distinguished and heroic father, Louis Bleriot, made the first flight across the Channel.

We are taking this opportunity to send to your Mother and yourself these anniversary greetings in the first all-jet airliner in the world to fly. This occasion will, I feel certain, mark a further point in the history of aviation—the commencement of the jet era of transport

Our best wishes to your Mother and to you are extended from all Members of the Royal Aero Club of the United Kingdom.

Yours sincerely,
Rupert L. Preston,
Secretary-General, R.Ae.C.



AERO-CLUB DE FRANCE — 25 Juillet 1948

Mon Colonel Preston

Ma mère et moi avons été infiniment touchés de la pensée que vous avez eue à l'occasion du premier vol commercial d'un avion à réaction entre Londres et Paris, de nous adresser les souvenirs et empreintes de pieds relatifs à la traversée de la Manche effectuée en 1909

par Louis Blériot

Nous vous remercions de tout cœur de cette attention et vous prions de la sympathie que nous gardons bien attachée au nom de notre père

Yours Sincerely

J Blériot

A facsimile of M. John Bleriot's charming reply to Col. Preston.

A page from the R.Ae.C. cuttings book of July, 1909.

In addition, one of the famous Royal Aero Club cuttings books, containing newspaper accounts of the historic flight in 1909, was sent for examination.

HAWKER P.1040

A LAND-BASED version of the new Hawker single-jet fighter, designated P.1040, and generally similar to the Naval N.7/46 illustrated last week, will be flown at the S.B.A.C. Display. The pilot will be S/L. "Wimpey" Wade and a speed of "well over 600 m.p.h." is mentioned.

FLYING-BOAT MISSING

NO trace had been found by Tuesday of this week of the six-engined Air France Latécoère 631 which was missing on August 1st. The aircraft left Martinique at 1550 hours on July 31st and was due to arrive at Port Etienne at 0200 hours the following morning. Widespread searches are being made by Air France and military aircraft. The flying-boat was carrying 40 passengers and a crew of 12.

An exclusive air-to-air photograph of the Airphibian flying above the south coast in the vicinity of the Isle of Wight.

Fulton Airphibian

Some Details of the Fulton Two-seat Road-Air Transport

THE successful demonstration of the Fulton Airphibian, manufactured by Continental Incorporated of Connecticut, at the *Daily Express* air pageant at Gatwick on July 10th, aroused considerable interest in flying and motoring circles. Mr. Robert E. Fulton, Jr., president of Continental Inc., who brought the second prototype machine to the United Kingdom, was reticent about many of the technical details of the Airphibian, but nevertheless some impressions of the machine, following exterior examination and passenger experience, have been obtained.

The interior accommodation is for two: "driver" and one passenger. After landing, the aircraft is made ready for use as a road vehicle in the following manner: The spinner is removed, disclosing a built-in, telescopic-type "tommy" bar which is used for unscrewing a lock-nut, after which the three-bladed wooden airscrew (which seems to be remarkably silent in the air), can be removed. The extension of three telescopic struts bearing small wheels forms a tricycle-gear which supports the wing when detached. Next, manipulation of a lever in the cockpit releases the wing from the "fuselage" centre section and the wing, complete with the rear portion of the fuselage and tail unit, can then be wheeled away leaving the vehicle ready for the road.

Flight controls are all operated by means of push-rods, and when the wing and rear fuselage are removed or replaced no work is required to disconnect or connect up these control rods as the members from the cockpit automatically register with their corresponding members. The two ends of these operating push-rods abut one against the other, there being two push-rods for each control, rudder, elevators and ailerons. The final operation before driving off is the engagement of the engine to the road transmission system. In the interests of simplicity no flaps are fitted, but the outer portions of the wings are equipped with fixed slots. The time taken for one person to complete the conversion is between four and five minutes.

The vehicle is steered on the ground with the aid of the same wheel as is used for control during flight, the front wheels swivelling within their "spats" which do not themselves pivot. Independent suspension is provided on all four wheels, the resilient elements being made of rubber. Engine throttle control is by a push-pull plunger on the dashboard and to obtain the more sensitive settings required for road work a device is incorporated in the control by which the throttle opening can be altered by a twisting movement of the plunger. Since the full power output of the 150 h.p. engine is seldom if ever required whilst motoring, the engine itself is run under very light loading and no cooling problems are encountered. The normal aircraft braking system which, when the vehicle is in road trim, is actuated by the right rudder-pedal, is found to work very successfully on the road.

The arrangement of the clutch mechanism has not as yet been disclosed, but it was observed that the conven-

"Flight" photograph.

The roadable part of the Airphibian. The airscrew has been removed and hung on the side of the rear fuselage until again wanted.

Fulton Airphibian . . . . .

tional clutch pedal was absent, suggesting to the enquiring mind that some sort of centrifugal take-up of the drive is incorporated. The absence of any gear lever further suggests that only one forward speed is available, though it is understood a reverse gear has been provided.

Road equipment is comprehensive and includes lights, windscreen-wiper, silencer and number plates. In this connection it is interesting to note that the front number plate appears to have an American and the rear a British registration. As the roof of the cabin is attached to the wing, which is removed, a canvas hood similar in effect to those fitted to touring or drophead motor-cars enables the vehicle to be used as either an open or a closed car. A cruising speed of 30 m.p.h. seems to be comfortably within the vehicle's capacity on the road and whilst it is understood that 40-50 m.p.h. can be achieved, very little information on this point could be obtained. The gross weight is given as 2,200 lb.

The Fulton Airphibian is rather more aircraft than car —a sensible compromise for a prototype in view of the relative dangers during the development work in both air and surface travel. It has an air cruising speed of about 105 m.p.h. at 2,300 r.p.m., and the manœuvrability and performance of a normal light aircraft.

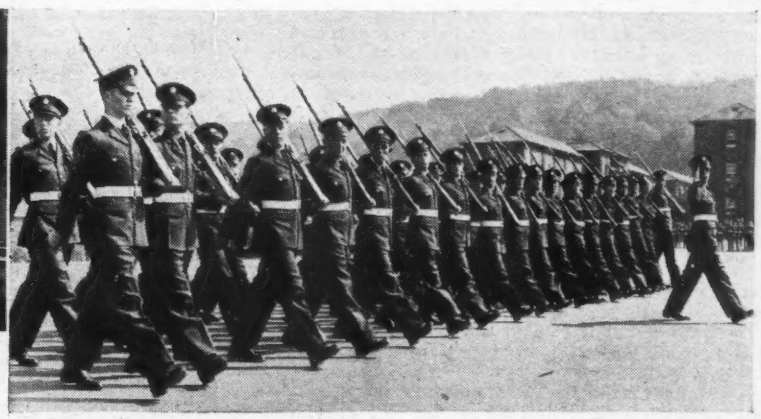
Halton Passing-out Inspection

IN brilliant weather the passing out inspection of the 51st entry of Aircraft Apprentices was held at the No. 1 School of Technical Training, R.A.F. Station, Halton Camp, on July 28th. The reviewing officer was Air Marshal Sir Leslie N. Hollinghurst, K.C.B. K.B.E., D.F.C.

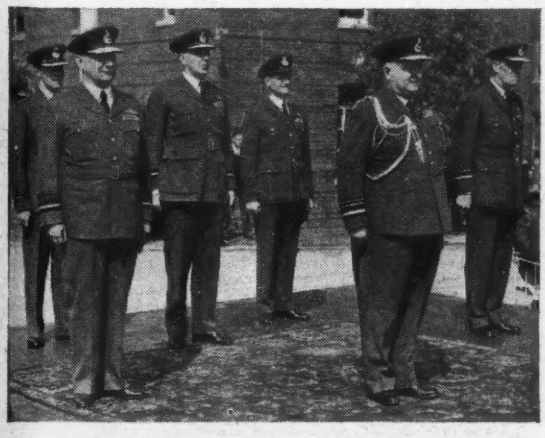
The Inspection, Ceremonial Parade and March Past, watched by high ranking officers and many spectators, served to show the high standards and physical fitness of the apprentices. A feature was that the parade was under the control of a Sergeant Apprentice with other N.C.O. apprentices as subordinate commanders. Air Marshal Sir Leslie Hollinghurst paid especial tribute in his address later to the high standard of drill on the parade, as well as the progress of the apprentices and offered them excellent advice.

The entry arrived at Halton in Feb., 1945, and now proceed to the R.A.F. Station, St. Athan for a further year's continuous training before being dispersed throughout the Royal Air Force as fully qualified tradesmen.

Addressing the assembly in the gymnasium, Air Commodore J. F. Titmas, C.B.E., commanding R. A. F. Station, Halton, announced that there were 1,683 aircraft apprentices under training at Halton, including the 51st Entry, who have now completed their training. The original strength of this Entry was 189; seven have been transferred to junior entries due to sickness, etc., five were discharged for various reasons, and 13 joined this entry from senior entries. 184 have now qualified to be mustered into the trades of Electrician, Fitter II Airframes, Fitter Armourer, Fitter II Engines and Instrument Maker. Four failed to qualify for remustering to a Group "A" trade. The overall percentage of marks of 57.9 per cent for trade classification did not reflect the true tradesman quality achieved by the Entry, their technical average being 60.2 per cent as compared with 48.9 per cent in technical educational subjects. The selection of apprentices from the top 25 per cent of the final Order of Merit, for cadetships leading to permanent commissions, has undoubtedly had a stimulating effect on training.



Sgt. Air. App. A. F. Becker, recipient of many awards, is congratulated by Sir Leslie Hollinghurst. (Right) The apprentices were extremely smart as they marched past.
"Flight" photographs



ON THE SALUTING BASE: (Left to right) G/C. J. Mutch; Air Marshal J. Whitworth Jones, C.B.; A. Cdre. J. F. Titmas, C.B.E.; W/C. D. R. Biggs, D.F.C.; Air Marshal Sir Leslie N. Hollinghurst, K.C.B., K.B.E., D.F.C.; and A. V-M. L. G. Harvey, C.B.

The following were awarded Cadetships:—

General Duties Branch: Air. App. R. C. B. Ashworth, Sgt. Air. App. A. F. Becker, Cpl. Air. App. M. Gill, Cpl. Air. App. K. B. Smith, Sgt. Air. App. A. R. Thomas, Ldg. Air. App. K. A. G. Wirdnam.

Technical Branch: Ldg. Air. App. S. L. Bugg, Cpl. Air. App. L. F. Gillard.

Secretarial Branch: Sgt. Air. App. B. E. F. Faulkner.

Prizes were awarded as follows and presented individually by the Reviewing Officer:—

Highest in Order of Merit All Subjects, Highest in Order of Merit General Service Efficiency, Highest in Order of Merit Educational Subjects; Sgt. Air. App. A. F. Becker won all three.

Highest in Order of Merit C.T.T.B. Practical Fitting, Test and Winner of Crebbin Robinson Cup: Air. App. G. Dixon.

Highest Average for Practical Fitting over 3 years' course: Ldg. Air. App. B. Sherburn.

Highest in Order of Merit in General Studies (and Winner Elliot Memorial Prize, presented by the Royal Aeronautical Society): Sgt. Air. App. D. Ellis.

Best Tradesmen in Central Trade Test Board Examinations: Fitter IIE, Cpl. Air. App.M. Gill; Fitter IIA, Air App. G. Dixon; Electrician, Ldg. Air. App. R. Loveluck; Inst/Maker, Cpl. Air App. L. F. Gillard; Fitter Arm., Ldg. Air App. J. B. Woodford.

On "Having a Go"

A Recollection of Early Flight Refuelling Experiences

By G. B. S. ERRINGTON, A.F.R.Ae.S.

IN an article on the North Atlantic flight refuelling trials, published in *Flight* of April 15, 1948, Sir Alan Cobham gave an answer to two queries raised by those who are still unconvinced that this system is practical. Sir Alan dealt at length with the psychological aspect. Perhaps an account of my early association with a phase in the development of the principle may be of interest. It may possibly be reassuring to intending and existing air-refuellers—including the "Million-mile Maestro."

As an example of tyro-ism *ad absurdum*, the following would be hard to beat:—

Shortly before the war Sir Alan Cobham had occasion to require a "stand-by" pilot for the experimental work proceeding at Ford airfield, and I was asked if I could find the time to "have a go"—co-operating with Geoffrey Tyson, not Wilfred Pickles!

My relevant attributes at the time: I owned a bicycle and was engaged on pursuits aeronautical in the approximate vicinity. I remember that in June, 1939, we did a turn in the AW 23 (Tiger 10s, said to be the forerunner of the Whitley), with Sir Alan Cobham driving, in order to watch the goings-on. Nine days later I had 10 min dual with Tyson on this "giant bomber," which vasty experience was followed by flying the machine there-and-then on my first flight-refuelling trials. Geoffrey Tyson passed me across some 600 gallons without let or hindrance.

The AW 23 was my first association with what, at that time, would be considered a heavy aircraft. Previous experience had been limited to some fiddled flying three years before, on a Ju.52 in Africa, so I was not an expert.

Tyson and I did it again next month, and then there was a pause of seven months, during which I had no "goes" at all. But in February, 1940, I was once again the "stand-in," having forgotten everything I had learned the previous June. However, so far as I could see, the procedure appeared most straightforward and simple, nor was there a suggestion of hazard in Cobham's aerial plumbing act—except, of course, my bicycle ride to and from the situation. Bicycle, by the way, should read in Service vernacular—bicycles/motor.

The few air-refuelling trials we did went very smoothly to plan, without incident or difficulty, and we certainly did not select our weather. In fact, it was all quite good fun and something out of the ordinary; they had just developed the "harpoon" contact method, which was then being tried out.

Things got so humdrum that, perhaps in order to keep the pilots' interest, Sir Alan Cobham suggested a diversion in the shape of "having a go" by night. And not, mark you, with all the illumination perqs. as might be so associated, but in the quite passable black-out of the time, when wardens were out for promotion.

I drove the AW 23 from Ford to Boscombe Down on February 24th, 1940, and, neither of us having handled a "giant bomber" at night before, we both thought it best to have a preliminary go at a circuit-and-bump. So, at 7 p.m., and using Boscombe Down's mobile floodlight (no runway then and flare-path lights broken down), we both did a couple of turns. I remember that we were congratulated by the good Sam McKenna on making very passable tangents to that important bit of Wiltshire.

At 11 p.m. that night all was set for the great adventure, and off we went into the void, Tyson intent on loading me up with between 600 and 900 gallons of petrol so that he could land light (at least that was the way I took it). No wireless, of course, and we had no means of location except that I promised to keep somewhere within a rate-one turn of the take-off point. We did have the benefit of a temporary lamp rigged on my starb. wing to illuminate the top.

We smelt about in a very orderly manner in our ink-black arena, and finally contacted each other, then proceeded with the hydraulics. Everything went to plan, the harpoon-contacting principle was, of course, ideally suited, and we landed some 45 min. later, having, I believe, established a little bit of history, by doing the first night air-refuelling trials over England, and certainly the first under black-out conditions. We did one or two more from Boscombe Down, usually about midnight, and that proved the principle to be quite satisfactory.

I think the point to indicate is that, though Tyson was an expert "air plumber," I had personally had negligible experience of really big aircraft, and certainly none at night. I had no experience of formation-flying, and the period between my air-refuelling cavortings was sufficiently lengthy to delete any question of familiarization.

Should lack of experience when successfully completing a number of manœuvres be an indication that that type of manœuvre must be a fairly simple one, then I would venture to suggest that there can be little apprehension for those about to undertake the aerial plumbing act. It need not be added that normally the participants in both units will be most experienced and fully qualified personnel.

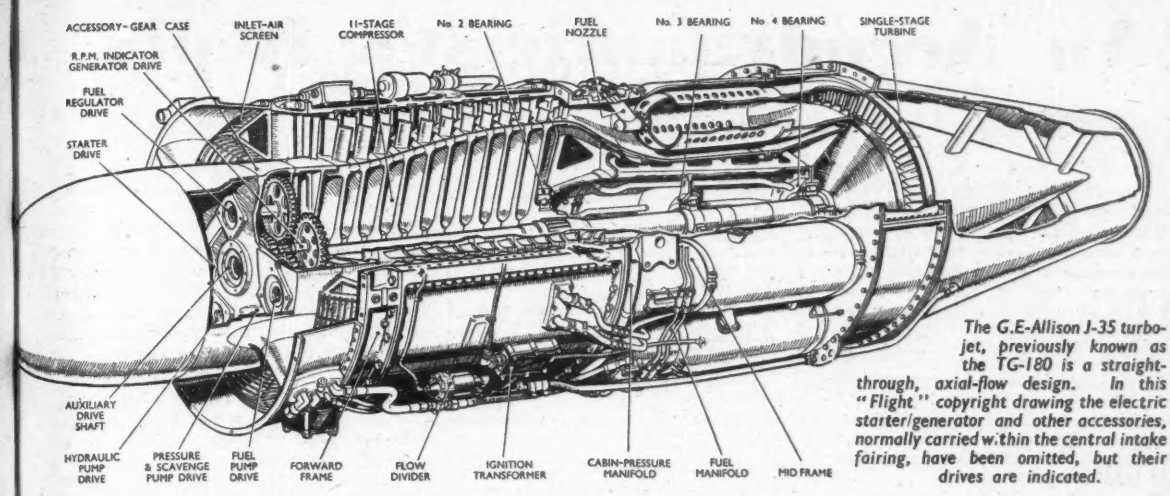
I hold no brief for, and am not connected in any way whatsoever with, Flight Refuelling, Ltd., but I am grateful to them for their suggestion to me, a decade back, to "have a go"!

IN this reminiscence Mr. Errington, now chief test pilot to Airspeed, Ltd., recalls how, some ten years ago, he was roped-in to lend a hand in early flight-refuelling trials. He was completely new to the work. Not only so, but he had no experience of large aircraft. Yet he managed without running into trouble, and without frightening himself or Geoffrey Tyson.

He fails to record whether, after he had "had a go," Sir Alan Cobham said "Give him the Money, Barney."

FORTHCOMING EVENTS

Aug. 7th.—Air Meeting and Competitions at Ypenburg, Holland.
Aug. 7th.—Midland Aero Club: "At Home." Elmdon airport.
Aug 14th.—R.Ae.S. (Graduate and Student): Visit to National Physical Laboratory, Teddington.
Aug. 14th and 15th.—Butlin's Week-end Air Rally at Pwllheli, N. Wales.
Aug. 15th.—Wiltshire Flying Club: Thruxton air races, Thruxton airfield, Andover, Hants. (Altered from Aug. 21st.)
Aug. 15th. — Rochester Flying Club: "At Home" The Airport, Rochester, Kent.
Aug. 18th to 28th.—Model Engineer exhibition, New Royal Horticultural Hall, Westminster.
Aug. 21st.—R.Ae.S. (Brough) and Brough Flying Club: Garden party and flying display. Brough airfield, East Yorkshire.
Aug. 21st to 29th.—International Aviation Week, Grenchen airfield.
Aug. 22nd.—Cowes Aero Club: Annual air display, Cowes airport, I.O.W.
Aug. 26th.—R.Ae.S. (Glasgow): Lecturettes, Grand Hotel, Glasgow.
Aug. 26th to Sept. 11th.—Machine Tool and Engineering exhibition, Olympia, London.
Aug. 27th to Sept. 5th.—Aero Club de France. "Tour de France."
Aug. 28th—R.Ae.S. (Graduate and Student): Visit to Vickers-Armstrongs
Aug. 28th and 29th.—Cinque Ports Flying Club: International flying meeting, Lympne airport.
Sept. 4th.—Northants Aero Club: Air display at Sywell.
Sept. 7th to 12th.—S.B.A.C. Exhibition and Display, Farnborough airfield, Hants.
Sept. 18th to Oct 3rd.—Copenhagen Show, organized by the F.B.I.
Sept. 25th and 26th.—Butlin's Week-end Air Rally at Ingoldmells, Skegness.
Sept. 28th.—R.Ae.S. (Glasgow): Film Evening, Prestwick airport.
Oct. 15th to 24th.—Third International Aircraft Exhibition, Forum Exhibition Hall, Copenhagen.



The G.E-Allison J-35 turbojet, previously known as the TG-180 is a straight-through, axial-flow design. In this "Flight" copyright drawing the electric starter/generator and other accessories, normally carried within the central intake fairing, have been omitted, but their drives are indicated.

Foremost American Turbojet

Some Details of the Slim, Axial-flow J-35

ALTHOUGH this country's confidence in gas turbine power units for civil air transports is not as yet shared by the Americans, they are nevertheless equally convinced that practically all military aircraft must in future be turbine-powered. The most widely used American conceived and produced turbojet is the J-35, designed by the General Electric Company and originally known as the TG-180. It is now under intensive development by the Allison Division of General Motors. An earlier plan was for the quantity production of this unit to be undertaken by the Chevrolet Motor Division, but in 1946 the production contract was transferred. All the details and equipment were moved from Tonawanda, N.Y., to Indianapolis, and production commenced early in 1947. Now, in addition to the Republic Thunderjet, of which large numbers are ordered for the U.S. Air Force, J-35s are installed in Douglas, North American, Consolidated, Boeing, Martin and Northrop prototypes.

Certain details of construction of the J-35 are still regarded as confidential, but all main features can be described. The design is based upon an eleven-stage axial-flow compressor feeding straight through eight combustion chambers to a single-stage turbine. The compressor rotor is made up of ten aluminium alloy discs and one steel disc, shrunk on to a hollow steel shaft. The discs each carry a stage of steel blades, and this hollow rotor assembly is supported on one roller and one ball thrust bearing. The stator casing is of the normal split type and carries eleven rows of steel stator blades between two separate single rows, one as a guide at the inlet and the other for straightening at the outlet end. Compression ratio is 4 to 1 and air mass flow at 7,770 r.p.m. at sea level is 70 lb/sec.

Stainless steel combustion chambers with flame tubes of the same material are fitted. Each has a Duplex fuel injection nozzle which feeds downstream.

Welding is used extensively for the turbine assembly. The nozzle guide vanes, of which there are 64, and their casing and diaphragm are a fabricated stainless steel structure. The 126 alloy steel turbine blades are welded to the rim of the turbine disc and the disc is in turn welded to the rotor shaft, which is supported in two roller bearings. The interconnecting shaft is splined to the compressor drum and secured by a single long bolt. The turbine outlet temperature at rated power is 675 deg. C.

Accessory gears and the front bearing are supplied with oil direct from the pressure pump as part of a dry sump system, while the three rear bearings are lubricated with oil mist, the requisite air supply being tapped from the fourth stage of compression. A General Electric direct-drive starter/generator is employed.

Unlike our own leading turbojets, such as the Rolls-Royce Nene, which must now be regarded as a competitor in America, the J-35 has an axial-flow compressor, and chiefly as a result of this feature the frontal area has been kept particularly small. The unit is by no means at the end of its development life, and the present rated thrust output, which is considerably below what the aircraft manufacturers would like, should slowly be increased to over 4,000 lb. With the aid of after-burning a large power boost can be achieved for a very short period, and it was in this way that the Douglas Skystreak research aircraft, powered by the J-35, achieved its record speed of 650.6 m.p.h.

G.E-ALLISON J-35 DATA

Diameter	37.5in
Length (with jet pipe)	145.0in
Frontal area	7.7 sq ft
Weight	2,425lb
Take-off power, static S.L.	3,750lb thrust at 7,700 r.p.m.
Rated power, static S.L.	3,270lb thrust at 7,400 r.p.m.
Cruising power, static S.L.	2,540lb thrust at 6,882 r.p.m.
Fuel consumption (cruising)	1,075 lb/hr/lb thrust
Oil consumption (cruising)	1.8 lb/hr

TRAGIC LOSS TO BRITISH GLIDING

ON Thursday, July 29th, two of Britain's leading glider pilots were killed while taking part in the International Gliding Contests in the Samedan area of Switzerland. Cdr. Chris Nicholson crashed in a storm over Mount Berlinghera, near Domodossola; Mr. Donald Greig was forced to bale out over Edolo on the Italian side of the Bernina Pass, and it appears that his parachute failed to open. These tragedies seem almost unbelievable, in view of the peaceful beauty picture in one's mind when thoughts turn to soaring in bright sunshine over the Alpine slopes. Cdr. Nicholson served with the Fleet Air Arm, and was a most talented architect. He leaves a widow and three children. Mr. Donald Greig was one of the first members of the London Gliding Club. We extend our deepest sympathy to their relatives.

Donald Greig.

Cdr. Nicholson.

An Aerodynamicist's Reply

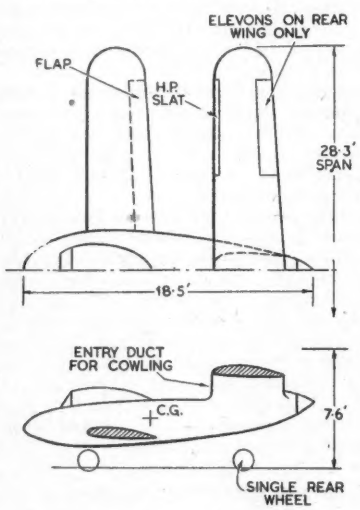
Suggested Layout of a Small Tandem Four-seater Pusher

By P. R. PAYNE

IN an article which you published in the February 26th issue of *Flight*, Robert Carling hit the nail very definitely on the head. His condemnation of the orthodox aircraft layout is by no means the first, of course, but except for a few half-hearted prototypes, no attempt has been made to remedy the situation. Thus we find ourselves in the very paradoxical situation of knowing what is wrong and wishing someone—preferably in another firm—would do something about it. The result is that aeromodellers have a virtual monopoly of new layouts!

The purpose of this article is to suggest a rational solution for one class of aircraft only: the light "family" flyabout. Here eight considerations are of paramount importance:—

(1) Reliability, mechanical and aerodynamic.
(2) Simplicity, small initial outlay.



Features of the design are engine in the stern, "elevons" which also act as ailerons. The machine is intended to be a two-control type.

(3) Robustness and low upkeep costs.
(4) Foolproof controls.
(5) Capacity for at least four people, with a range of not less than 500 miles.
(6) Low stalling speed.
(7) Excellent ground stability.
(8) Low noise level in the cabin.

The layout shown in the sketch seems to offer the best possible solution for this case. We not only have the engine in the rear, as Robert Carling pleaded, but a more or less foolproof aircraft at the same time. Taking the aerodynamic aspect in relation to the requirements listed above we can say that only (1) and (4) are of first-order importance. Reliability is mainly a matter of stability and stalling characteristics, and in this respect the tandem is excellent: "controls-free" flying is possible under very bumpy conditions, whilst in the stall the nose drops sharply without the aircraft having any tendency to spin. The efficiency of the rear wing as a stabilizer is 63 per cent, by the way.

IN the article referred to by Mr. Payne, Robert Carling was thinking more in terms of larger aircraft. However, the tandem arrangement has considerable appeal in small sizes, and the engine in the stern solves the transmission problem.

As shown, the design is very clean, but it should be pointed out that in the Miles M.35, the flying mock-up which preceded the Libellula, wing-tip fins and rudders were found necessary.

It seems a little doubtful that the "elevons" in this design would suffice.

Control is provided by the elevons, which are operated by a push pull steering wheel, and since only this and the throttle have to be used in flight, the machine approaches the ideal from the A-licence point of view. Brakes are, of course, essential, and should be operated by two car-type pedals or linked to the steering wheel. A simple flap lever, with "up" and "down" positions only, completes the list of controls.

The estimated weights and performance of the machine are as follows:—

Weights

Tare weight: 1,695 lb.
Gross weight: 2,825 lb.
(Load is four passengers plus 37 gallons of fuel and 200 lb of luggage.)
Wing loading: 14.12 lb/sq ft.
Power loading: 23.53 lb/hp.

Engine

D.H. Gipsy III, giving 120 b.h.p. for take-off and 110 b.h.p. for cruising.

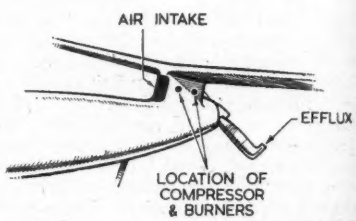
Performance

Maximum speed: 130 m.p.h.
Cruising speed: 125 m.p.h.
Stalling speed:
56 m.p.h. (fully loaded);
45 m.p.h. (pilot only with empty tanks).
Still-air range: 500 miles.

Alternative Power Unit

Whilst jet rotated helicopter blades are projected in many quarters, no one seems to have thought of applying the principle to light aircraft airscrews.* If the design were such that the tips were moving at a Mach number of about 0.8, there is no reason why the fuel consumption should be much greater than that of the corresponding I.C. engine, whilst the saving in weight would be considerable. Since the airscrew would have to be of the variable-pitch type for optimum results, it would also be quite feasible to reverse the pitch for landing in very small fields. The application of this unit to the tandem might take the form shown in the second sketch. Comparative weights are given below:

	I.C. ENGINE	GAS TURBINE
	lb	lb
Engine (dry) ..	295	—
Compressor and turbine	—	100
Mounting	25	20
Accessories ..	47	40
Airscrew	20	40
Fuel (4 hours) ..	290	350
Fuel tanks	44	50
Total	721 lb	600 lb



A possible development is the jet-driven airscrew.

** Our contributor is wrong. Such a scheme was, in fact, put forward some years ago by Mr. Ebbutt, of Heston Aircraft.*—ED.

NEW DEFENCE ADVISER

AIR CDRE. E. C. Hudleston has been appointed head of the United Kingdom's military delegation to the Western Union Military Staff Committee, with the rank of Acting Air Vice-Marshal. As A.O.C. 2nd Tactical Air Force Group supporting the First Canadian Army in the Western Front he was, at 36, one of the youngest officers holding this rank. He organized the air attacks on railways, dumps and V2 launching sites which had the effect of reducing the scale of rocket bombardments of this country.

HAMBLE VISIT

AIR MARSHAL SIR ALAN LEES, K.C.B., C.B.E., D.S.O., A.F.C., A.O.C.-in-C., Reserve Command, recently inspected No. 14 Reserve Flying School, operated at Hamble by Air Service Training. The official opening of the new R.A.F.V.R. lounge and bar in the A.S.T. club building took place during his visit. Sir Alan was accompanied by W/C. H. F. Jenkins, O.B.E., A.F.C., Chief Instructor and General Manager (Training), A.S.T.; W/C. A. H. Abbott, C.F.I. at Hamble; S/L. T. D. Misselbrook, D.F.C., Officer Commanding No. 23 Reserve Centre; and F/L. A. G. Mott, also of No. 23 Reserve Centre.

No. 14 Reserve Flying School now has well over 100 members, drawn from Hampshire and adjoining counties, but would welcome more.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE PLANET SATELLITE

Stalling Speeds Too High?

I WAS most interested in the article on the Planet Satellite which appeared in your issue of July 15th. It is most stimulating to read of such a complete breakaway from the usual stereotyped design in this field, and confirmation of the estimated performance will be awaited with interest. However, I should like to make a few remarks on the estimated take-off and landing characteristics. The wing loading of 19lb/sq ft at the gross weight, and the resultant stalling speeds of 68 m.p.h. flaps-up and 62 m.p.h. flaps-down, must be considered high for a single-engined personal aircraft and, in fact, the writer has been unable to find those values exceeded by a similar machine. Incidentally, the Armstrong-Whitworth Ensign four-engined air liner, and the fairly early Hawker Hurricanes, had stalling speeds of a very similar value to this.

In this connection, a common enough reason given by designers for a relatively high stalling speed is that it is better to have a good-natured stall at a moderate speed than to drop a wing at a lower speed. Few will disagree with this dictum, but in point of fact, the Miles Messenger and Gemini manage to retain innocuous stalling characteristics at 25 m.p.h. and 35 m.p.h. respectively.

Since a primary aim in the design of the Satellite has been to keep the selling price to a low figure and thereby to find a large market, this point would seem to warrant some consideration. Again, the ranges of 1,000 miles with full payload or 2,450 miles with the pilot only, should not be of very great interest to the private owner, when a four-engined aircraft would give considerably greater safety. L. H. W. HARRIS.

Yeovil, Somerset.

GREATER AIR SAFETY

High Flash-point Fuels and Crash-proof Tanks

I HAVE read with considerable interest the editorial comments and correspondence following the publication of my article —"Towards Greater Air Safety"—(May 20th), and I would like to make a few further comments on the subject.

Many of your correspondents have argued the pros and cons of the use of "safety" or high flash point fuels. I think most people will agree, however, that the use of diesel oil is not a practicable proposition with aircraft engines, and the day when all aircraft will use jets is some years ahead, particularly for small and medium sized aircraft not designed to fly at great altitudes.

There appear to be two features common to the arguments propounded:

1. That the provision of more and better emergency exits is considered the most suitable means of reducing the number of deaths through burning, by reducing the likelihood of being trapped in the aircraft.
2. That the use of high flash point fuels is considered to be a better safeguard than the use of crash-proof tanks.

The first conclusion assumes that passengers are able to reach the emergency exits under their own power, but in many cases they are likely to be injured and unable to move. The first requirement, therefore, is a crash resistant protective seat, which will give uniform support to the body during decelerations up to 25g. This can only be done by fitting rearward facing seats, as forward facing seats and safety belts cannot provide anything like the same amount of protection. I do not think anyone could strongly object to rearward facing seats; after all, half the seats in a railway train face aft, and the sense of relative motion is much greater in a train than in an aircraft unless it is flying very low indeed. The present trend in "executive" and "V.I.P." aircraft furnishing styles is to place the seats facing each other, with a table between them. This arrangement, however, favours the rearward facing passenger, who is well protected in the event of a crash, while the forward facing passenger will be thrown violently against the table.

Emergency exits should be placed on both sides of the aircraft in case one side is obstructed through the fuselage lying on its side, or through the exit being jammed against a large obstruction.

Regarding the second conclusion, the argument for safety fuels must assume that diesel engines are to be used, for although paraffin admittedly does not ignite so easily as petrol, under certain conditions, such as a large accumulation of vapour inside the wing, it can detonate with extreme violence, and the explosion might do as much damage as a petrol fire.

The objections to crash-proof tanks seem to be based on the ideas that they are very heavy and that they involve a considerable reduction in fuel carrying capacity. This argument can only be applied to rigid metal tanks fitted with a crash-resistant covering, a type which is not very effective. The reasons for the bursting of metal tanks are (a) the hydraulic shock wave which is built up inside the tank and which bursts it *outwards*, and (b), the distortion of the surrounding structure which produces similar distortion and rupture of the rigid tank inside it. An adequate covering to protect a rigid tank against these forces calls for the application of numerous layers of high rip-strength fabric which build up the wall thickness and add a lot of weight, much of which is due to the amount of cement required to stick the layers together.

The only tanks which are really effective are flexible bag tanks, and these are not only lighter than metal tanks but provide considerably more fuel capacity in an equivalent tank bay. Their wall thickness is less than a sixteenth of an inch and they are made to fit the compartment exactly, with no waste space. Obviously they must do, for they are not self-supporting and are only held in shape by the aircraft structure, hence when the structure distorts, the tank goes with it and suffers no damage.

By far the most important consideration, however, is the hydraulic shock wave caused by a sudden deceleration of high magnitude, such as, for instance, if an aircraft crashed and the wings came into violent contact with some solid obstructions. Usually in these cases the wing skins are burst outward by the movement of the fuel which distorts the forward end of the tank, and the forces generated inside the tank are expended on the aircraft structure, the tank remaining undamaged.

Whilst agreeing with your correspondents who have pointed out that pipe lines, etc., can be broken in a crash, I would point out that the amount of fuel which can get out of a fuel pipe which is quite probably crushed, thus reducing its effective bore, is nothing like as much as will pour out of a tank which is ripped open. If one can reduce the quantity of fuel feeding the fire, then either it can be got under control and prevented from spreading, or more time can be gained to extricate the occupants of the aircraft. Even a few minutes' breathing space gained can make all the difference between none saved and all saved.

First, rescuers who reach the aircraft can get more people out, secondly by preventing the fire from reaching the fuselage a panic can be averted and the occupants can do more to help themselves. Fire creates panic more than anything else, and since panic destroys reasoning powers, the resultant struggles to get away from the flames become futile and aimless. Fear of fire is a deep rooted instinct in all living creatures, and the fact that it can so easily cause panic is shown by the great attention paid, for instance, to fire precautions and emergency exits in theatres and cinemas, where large numbers of people congregate in a confined space. Thirdly, anyone experiencing a deceleration of anything over 1g is going to be considerably shaken up and may require some time to recover.

If only a few seconds elapse between the shock of impact and the envelopment of the cabin by fire, then most people will not have pulled themselves together in time to think about getting out. If the interval can be increased to a few minutes, those able to move are given a chance to recover and help those not so fortunate, and the crash-proof tank can, by remaining fuel-tight, prevent the spread of fire for those essential few minutes.

Alternatively, if fire fighting equipment is quickly on the scene, the fire may be put out before it has got too great a hold. In either case the tank will have served its purpose from the crash protection point of view, while the fact that a bag tank installation has such a highly efficient capacity/weight ratio means a greater range for the aircraft, and therefore a better fuel reserve factor when flying in bad weather conditions.

Wolverhampton, Staffs. W. A. HANNAM.

SERVICE AVIATION

TROOPSHIP: That a standard transport aircraft of the R.A.F. should have a performance greatly superior to that of contemporary 4-engined bombers may seem anomalous. One explanation of the efficiency of the Handley Page Hastings, the type concerned, is its exceptionally clean aerodynamic design, seen to advantage in this "Flight" photograph.

Air Council Reception

MR. ARTHUR HENDERSON, Secretary of State for Air, received the guests at a reception in honour of Members of Parliament who have served in the R.N.A.S., R.F.C. and R.A.F., held in the Air Council Chamber on July 26th.

Among the Members of Parliament who accepted invitations to attend were: Mr. Frank Beswick, Mr. Rupert de la Bere, F/O. Bowden, Mr. Charles Challen, Mr. Aiden Crawley, Mr. W. M. Cuthbert, Mr. Norman Dodds, S/L. P. W. Donner, Mr. Terence Donavan, S/L. E. L. Fleming, Sir Gifford Fox, Mr. John Haire, W/C. Hulbert, A. Cdre. Harvey, Mr. Christopher Hollis, M. E. H. Keeling, S/L. Kinghorn, Mr. Harold Lever, Mr. Ben Levy, Mr. Ernest Millington, Sir Peter MacDonald, Rt. Hon. M. McCorquodale, Mr. E. T. Parkin, Mr. Kenneth Pickthorn, Mr. Victor Raikes, Mr. Harvey Rhodes, Mr. Emrys Roberts, Dr. S. Segal, Mr. E. E. A. Shackleton, Major H. R. Spence, Rt. Hon. J. Strachey, Mr. William Teeling, Mr. J. R. Thomas, Mr. H. Thorneycroft, Major W. F. Vernon, Sir Wavell Wakefield, the Hon. G. Ward, Mr. D. G. West, G/C. C. A. B. Wilcock, and Major F. J. Wise, together with members of the Air Council and senior officers.

French Visit by R.Aux.A.F. Sqdn.

A SQUADRON of the Royal Auxiliary Air Force recently spent a week-end in France as the guests of the French Air Force. The visit was paid by No. 601 (County of London) Squadron, six of whose Spitfires, piloted by officers of the squadron, and an Anson, with a crew of two officers and carrying five airmen as passengers, flew from Hendon on Saturday morning, July 24th, to Mont de Marsan, in South-West France, where the party was shown over the French Air Force Experimental Station in the afternoon. On the following day the visitors were taken by car to Bayonne and Biarritz, and flew back from Mont de Marsan to Hendon on the Monday morning.

Royal Air Force and Naval Aviation News and Announcements

A.T.C. Exchange Visit

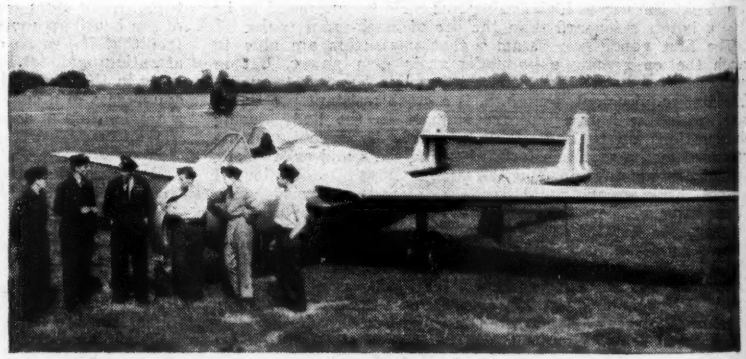
ACCOMPANIED by two officers, 25 Canadian Air Cadets arrived at Northolt on August 4th in a R.C.A.F. North Star aircraft on an exchange visit with cadets of the Air Training Corps. The two parties will meet to-day after which the A.T.C. party will leave for Canada in the same aircraft.

During their stay here the Canadian cadets will attend the A.T.C. rally at Halton this week-end and will then leave for the big A.T.C. summer camp at Dishforth, Yorks, on August 8th. They will be the guests of No. 64 (Northern Reserve) Group and No. 66 (Scottish Reserve) Group during that particular week, spending the Wednesday in camp with A.T.C. cadets at R.A.F. Turnhouse, Edinburgh. On Monday, August 16th, they will visit Cranwell, and on the Tuesday, Portsmouth Dockyard, after which the rest of the week will be passed in London.

The British party will stay three days with Canadian cadets in camp at Aylmer, Ontario, after which they will visit Niagara Falls and then spend four days cruising on the Great Lakes in a 600-ton luxury yacht. Two more days will be spent at the Aylmer camp, and the party will then visit R.C.A.F. headquarters at Ottawa. The remaining days of the tour will be occupied by visits in Montreal.

Appointments

THE acting rank of Air Marshal has been granted to A.V-M. J. Whitworth Jones, C.B., C.B.E., on taking up the appointment this month of Air Officer Commanding-in-Chief, Technical Training Command, R.A.F. His appointment to this post in succession



FIRST OF THE MANY: F/L. J. Button, D.S.O., D.F.C., and ground crew of No. 605 Squadron, R.Aux.A.F., with the squadron's first Vampire, which arrived during their recent annual camp at Tangmere. As previously reported in "Flight," No. 605 is the first of the Auxiliary squadrons to be equipped with jets.

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to Air Marshal Sir Ralph Sorley, who has now retired from the active list, was announced in April.

AIR COMMODORE (Acting A.V-M.) Cecil Arthur Bouchier, C.B., C.B.E., D.F.C., has been appointed Air Officer Commanding No. 21 Group, Flying Training Command, retaining the acting rank of Air Vice-Marshal, with effect from July 9, 1948.

Until recently A.O.C., Air Group, British Commonwealth Occupation Forces, Japan, where he went in October, 1945, after having been A.O.C. No. 221 Group, Air Command, South-East Asia, for four months, A.V-M. Bouchier was formerly Senior Air Staff Officer, 11 Group, Fighter Command, from July, 1944, and for a year previously was S.A.S.O. at Fighter Command Headquarters. In 1942 he was at the Air Ministry as Deputy Director of Flying Operations and earlier in the war he commanded the fighter station at Hornchurch during the Battle of Britain before going to 11 Group Headquarters on day-operational duties in December, 1940.

Musicians Wanted

BANDMASTERS of the Royal Air Force Regional Bands are to be given a higher status. Formerly Warrant Officers, they are now to be commissioned with the rank of Flying Officer. Recruits for the trade of musician in the R.A.F. are urgently needed. They must have a fair degree of skill on any of the usual military band instruments, as there are at present no basic musical training facilities in the Service. An apprenticeship scheme is now under consideration under which boys will be given a three-year training course as R.A.F. musicians. A Royal Air Force School of Music is to be formed as soon as suitable accommodation is available, but this will be primarily for training Bandmasters.

Defence College Course

THE following Royal Air Force officers have been selected for the 1949 course at the Imperial Defence College:

A. Cdre. Sir Harry Broadhurst, K.B.E., C.B., D.S.O., D.F.C., A.F.C., Air Officer Commanding No. 61 (Eastern Reserve) Group; A. Cdre. the Earl of Bandon, C.B., D.S.O., Commandant, Royal Observer Corps; A. Cdre. F. J. Fressanges, C.B., Director of Operations, Air Ministry; A. Cdre. T. G. Pike, C.B., C.B.E., D.F.C., Director of Operational Requirements (A), Air Ministry; A. Cdre. H. D. Spreckley, O.B.E., Commandant, Empire Air Armament School; G/C. (acting Air Commodore) A. W. B. McDonald, A.F.C., Commandant, R.A.F. Staff College, Andover; G/C. G. P. Chamberlain, C.B., O.B.E., Director of Civil Air Operations, Ministry of Civil Aviation; G/C. E. N. Lowe, C.B., O.B.E., Officer Commanding, No. 16 Maintenance Unit.

This will be the fourth post-war course at the College and will last from January to December.

M.U. Merger

NOS. 389 Maintenance Unit and No. 390 Maintenance Unit, Royal Air Force, have merged with Headquarters R.A.F. Base, Seletar. Under the command of Air Commodore G. P. H. Carter, C.B.E., the new formation is known as R.A.F. Maintenance Base (Far East), Seletar, and will be responsible for the supply and repair of all forms of service equipment, including aircraft, marine craft and motor transport, to all units in Air Command Far East.

Recruiting of R.A.F.V.R.

RECRUITING of navigators and signallers for the Royal Air Force Volunteer Reserve has begun at No. 44 R.A.F. Reserve Centre, Castle Bromwich airfield, Warwickshire, and No. 5 R.A.F. Reserve Centre, Cambridge airfield. Flying training will take place at the airfields at which the Reserve Centres are located. These new centres known as No. 5 and 22 Reserve Flying Schools respectively, are already open for the training of R.A.F.V.R. and W.A.A.F./V.R. pilots, recruiting for which began some time ago. Recruiting for navigators and signallers is already open at Panshanger, Fairoaks, Woodley, Hamble, Rochester, and Perth, so there are now eight schools at which these categories of R.A.F.V.R. can be trained.

TROUBLE SHOOTERS: Three R.P.-equipped Spitfires on the airfield at Kuala Lumpur being prepared for one of the R.A.F. attacks on Malayan terrorists in the neighbouring jungle. Previous sweeps by Spitfires had shown that a big concentration of terrorists was hiding in the Semenyit area, to the south of Kuala Lumpur, and two insurgent hide-outs were attacked; a direct hit was scored on another occasion on the the insurgent headquarters. Later, R.A.F. Spitfires supported troops and police in a large-scale round up of terrorists.

R.A.F. Regiment (Malaya)

NO. 93 Squadron of the R.A.F. Regiment (Malaya) is now being formed and 160 selected recruits from all over Malaya have had their medical tests at R.A.F. Station, Sembawang. The squadron is commanded by S/L. D. G. Roberts, and the second-in-command is F/L. J. H. Thacker.

New C.O. for Boscombe

AIR COMMODORE H. L. PATCH, C.B.E., who was at the Air Ministry from last December until recently as Director of Operational Training, has just taken up a new appointment as Officer Commanding the A. and A.E. Establishment at R.A.F. Station, Boscombe Down, Wiltshire.

An armament specialist, A. Cdre. Patch served with Bomber Command, at headquarters, or in command of bomber stations, from the end of 1938 until early in 1943, and spent the last two years of the war at the Air Ministry as Director of Armament Requirements. Afterwards, as Air Officer Commanding No. 44 Group of Transport Command, he was responsible for the organization and operation of the air traffic controls serving the air transport routes across the Atlantic, the Mediterranean and the Continent of Europe. He held this post for five months until July, 1946, when he went to Uxbridge in command of Air Traffic Headquarters. Later he was for a time head of the Joint Aircraft Control Board. He was educated at Stonyhurst College and the Royal Air Force College, Cranwell, from which he was commissioned in the R.A.F. in 1925. He is chairman of the R.A.F. Boxing Association.

Liaison Visit

NEW problems that will face aircraft navigators with the introduction, at some future date, of high-speed high-altitude jet bombers are among the subjects to be discussed with the Royal Canadian Air Force and the United States Air Force by a liaison team from the R.A.F. Empire Air Navigation School, Shawbury, Shropshire, which leaves on August 9th for a month's tour of Canada and the U.S.A. Another object of the visit is to explain and discuss the recent Air Ministry decision that all R.A.F. navigators shall have career prospects comparable with those open to pilots.

Commanding the flight, which will be made in an Avro Lancastrian, will be G/C. C. E. Chilton, C.B.E., Deputy-Director of Navigation at the Air Ministry. S/L. P. D. Tunstall will be captain of the Lancastrian, and other crew members will be F/L. J. D. Woods (2nd Pilot), F/L. Bower (Navigator), F/L. J. A. Kraemer (2nd Navigator), M. Sig. W. J. Ashcroft, D.F.C., A.F.C. (Signaller), Sgt. R. H. Croxford (Fitter), Sgt. J. L. Evison (Fitter), and Cpl. H. V. Clinton (Instrument Maker and Electrician). W/C. A. M. Taylor will represent the Navigation Training branch of the Air Ministry, and W/C. P. B. Wood the Operational Requirements branch.

Royal Observer Corps Exercise

SOME 100 R.A.F. aircraft took part in a Royal Observer Corps exercise covering twelve counties of Southern England on Sunday, July 25. The Fighter Command raid-reporting system was manned for the exercise, which lasted from 10 a.m. until 6 p.m. R.O.C. operations centres at Beckenham, Colchester, Horsham, Maidstone, Watford

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and Winchester were active, and nearly 3,000 observers, most of them at outdoor posts, were on duty. Meteor and Vampire jet fighters and Fighter Command Hornets took part in the exercise, with the addition of Spitfire squadrons of the Royal Auxiliary Air Force, Reserve Command, and a small number of Lincolns and Lancasters from Bomber Command. A. Cdre. the Earl of Bandon, Commandant of the Royal Observer Corps, accompanied by Area Commandants, watched the progress of the exercise from one of the operations rooms.

Two New A.D.U's. Formed

TWO new Air Defence Units, No. 3507 and No. 3509 (County of Staffs) of the Royal Auxiliary Air Force have now been opened for recruiting, the former at Rudloe Manor, Box, Chippenham, and the latter at Trentham Institute, Stoke-on-Trent. At the moment No. 3509 A.D.U. is open for recruitment of airmen only, but officers and W.A.A.F./R. airwomen will be recruited shortly. Meantime, men are required for most trades, including transport and administration, and those with experience of radar, wireless and plotting aircraft are particularly required. Previous Service experience is not essential.

Operation "Wattleberry"

THREE Sunderlands of No. 209 Squadron, R.A.F., operating under the code name "Wattleberry," recently completed the first post-war training and good will flight from Singapore to Sydney by flying boats. The aircraft taking part in this operation, which involved a round flight of over 11,000 miles, were *Rajang River, Brunei Bay* and *Flying Fish Cove;* G/C. R. B. Harrison was the officer in charge of the operation.

Flying in easy stages the first stop was made at Labuan, British North Borneo. The next stage was to Darwin, some 1,650 miles on, and after a two-day halt the Sunderlands took off again for Sydney. A few minutes after being airborne, however, the *Brunei Bay* developed an oil leak in one of her engines. After a return to land it was found that the faulty engine would have to be changed, but as the nearest spare was on the other side of the Continent it was decided to continue the flight on three engines. By shortening some of the intermediate stages to conserve fuel and manned by a skeleton crew to reduce weight, the *Brunei Bay,* with the other two Sunderlands, successfully completed the journey.

LIAISON LINCOLN : The first Lincoln of No. 44 (Rhodesia) Squadron, R.A.F., which recently paid a visit to the Colony, taxying in at Salisbury, Southern Rhodesia. Inset is G/C. N. C. Odbert, O.B.E., who commanded the flight, A. Cdre. G. G. Banting, C.B., C.B.E., Air Officer Commanding Rhodesian Air Training Group, and G/C. G. A. Walker, C.B., D.S.O., D.F.C.,

A MODEL ATTACK: A Barracuda 3 of 815 Squadron, piloted by Sub-Lieutenant Bradley, R.N., diving through an "ack-ack barrage" to make a low-level bombing attack on a 40ft model of H.M.S. Nelson at the open-air display held at R.N.A.S. Arbroath on July 21st.

R. Aux. A.F. Appointments

THE Air Ministry announces the following Royal Auxiliary Air Force appointments:

S/L. H. S. L. Dundas, D.S.O., D.F.C., to command No. 601 (County of London) Flying Squadron, R.A.F. Hendon.

S/L. J. M. Birkin, D.S.O., D.F.C., A.F.C., to command No. 504 (County of Nottingham) Flying Squadron, R.A.F. Hucknall.

Permanent Commissions

THE following officers have been selected for permanent commissions in the R.A.F. in the branches shown:

General Duties Branch

W/Cs. J. B. J. Boardman; E. J. Brooks, D.F.C.; H. Budden, D.S.O., D.F.C.; E. C. S. Fewtrell, D.F.C.; H. A. R. Holford, O.B.E., D.F.C.; M. M. Kane, M.B.E.; D. F. Laslett; D. D. Rogers.

S/L.s K. W. Mackenzie, D.F.C.; W. W. T. Titchie, A.F.C.; R. W. Turner, D.F.C., A.F.C.

F/L. P. J. S. Shaughnessy.

Equipment Branch

S/L. J. W. C. N. Young.

F/L.s G. L. Armstrong; A. F. P. Beard.

R.A.F. Regiment

F/L.s M. J. Burgess; C. F. Wright.

Physical Fitness Branch

F/L.s H. O. Jones; G. F. Turnbull, A.F.C.

Technical Branch

S/L.s L. J. Davey; C. H. C. Down, M.B.E.; D. E. Gibbs; K. Herring; W. A. Jones; F. Parvin; A. M. Paterson, O.B.E.; K. H. Wallis.

F/L.s D. H. Beckett; R. L. Cater; W. H. Dron; S. A. Fentum; W. T. Glazier; R. Howard; H. D. Hughes; G. E. F. Johnson; N. M. Jones; S. F. Kettell; J. E. Loxton; J. Miles, M.B.E.; I. Pangbourn; J. Spence; A. Stewart; R. Storey; R. S. Voyle; B. G. Wareham.

F/O.s H. Chant; K. C. Skillman.

Secretarial Branch

W/C.s H. F. Bishop, O.B.E., A.F.C.; W. H. Franklin, O.B.E.; F. C. Hornsby-Smith.

S/L.s L. G. Ash; I. G. Best; H. S. Burrows; N. S. C. Chapman; W. K. G. Nicholls; P. G. D. Taylor; E. S. Witchard.

F/L.s G. A. Bowen; G. Brand; J. A. R. Chambers; L. V. Cruickshank; J. Davies; W. A. Harrison; J. Johnston; D. R. Jones; E. W. Mayfield; S. J. Palmer; R. J. Wasley; W. H. Wheeler.

F/O.s C. W. Evans; A. J. L. Maunder.

Chaplains Branch

Rev. T. A. Jenkins, B.A. (C. of E.).

Medical Branch

W/C. D. W. I. Thomas, M.R.C.S., L.R.C.P.

S/L.s E. S. Odbert, M.B., B.Ch., B.A.O., B.A.; S. M. Rigg, M.B., Ch.B.; C. G. White, B.M., B.Ch.